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ABSTRACT

This report details the establishment of a cooperative planning group for high technology training programs and development of a brokering service model. The first three chapters present some background material on the geographic, educational, and industrial setting in Vermont and overview the changes facing the industrial work force. Chapter 4 summarizes these project processes and activities: establishment of a technical advisory committee, identification of other key resources, assessing the need for skilled workers and for training programs, determining appropriate sponsorship, and creating a delivery system model. The next section reports findings with implications for further work in this area, including a list of job titles (with skills) important to Vermont industry and a list of institutions interested in participation. Chapter 6 describes the brokerage service model. Two basic roles, ongoing needs assessment and brokering of custom training services, are emphasized. These other roles are considered: brokering of training materials, brokering of placement services, and faculty lend-lease. Constructive communication, undertaking of training programs, and adoption of the brokering service model are reported as outcomes in chapter 7. Chapter 8 summarizes project conclusions. Appendixes include a skills list by job title and occupations important to high technology industry with associated skills. (YLB)

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ED237705

FINAL TECHNICAL REPORT

TO THE

OFFICE OF VOCATIONAL AND ADULT EDUCATION
U. S. DEPARTMENT OF EDUCATION

on the contract for

"A Consortium Involving Business, Industry, Post-secondary and Vocational Institutions: Planning for Statewide High Technology Training Programs"

Prepared by

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September 30, 1983

CE 037707

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Chapter 1

INTRODUCTION

In Vermont, as in many other states, there is a considerable disparity between the skills of the state's available work force and the ever-changing needs for skilled workers in the complex high technology fields. The skill levels and characteristics needed for Vermont's work force are speculative at best. The providers and potential providers of high technology training should meet these needs in a proactive, rather than a reactive manner. To do this, a systematic model for assessment of skill needs and planning for responsive, timely training programs is necessary.

Because of its size, Vermont provides an excellent laboratory for the development of such a model. With a population of less than a half million people, yet with a full complement of industrial, governmental, and educational services, Vermont provides a setting in which many of the barriers to model development can be challenged. And yet, because of its demographic characteristics, the changes resulting from such an experiment can be observed and analyzed in a relatively short period of time.

Of the roughly 500,000 persons in Vermont, nearly a third live in the state's only "urban" area, greater Burlington (Chittenden County). The greater Burlington area is home to the largest of the state's high technology industries: Digital Equipment Corporation, General Electric Company, and IBM. That is not to say the rest of the state is without high technology employers. In fact, there are high technology businesses and industries in nearly every region of Vermont--what they lack in size, they make up in numbers and innovations.

Whatever their characteristics, all of these firms face a similar problem: how to get, keep, and update a productive work force. In Vermont, as in many other states, there is no statewide forum through which the industrial and business needs for skilled workers can be reconciled with available and potential training programs.

SCOPE OF WORK

It is in reponse to this problem that the Vermont State Colleges secured a contract with the U.S. Department of Education. The Vermont State Colleges agreed to develop and sponsor a systematic training model which would include:

- a model, cooperative planning group composed of members from business, industry, vocational schools, and post-secondary institutions interested in planning for high technology training programs;
- a model plan for the development of instructional modules and materials for high technology training programs for Vermont;
- equitable access to the planning process for large and small, urban and rural, manufacturing and service high technology businesses;
- high technology solutions to high technology training problems; and
- dissemination of information about project results.

CONTRACT SPECIFICATIONS

The contract was for the period October 1, 1982 through September 30, 1983. For this period, ten tasks were designated in the contracts "Scope of Work" requirements:

Task 1: The establishment of a Technical Advisory Council representative of the users and providers of high technolopgy training.

Task 2: The identification of other resources available to the state of Vermont. These included interested people, materials, and out-of-state resources.

Task 3: The development of a plan for assessment of needs for skilled workers which will enable one year and longer range forecasting of skills needs.

Task 4: The pilot testing of this plan by the assessment of skills needs and interpretation of the assessment results.

Task 5: The development of a plan for the assessment of needs for training programs which would enable appropriate programatic response to skills needs.

Task 6: The pilot testing of this plan by the assessment of training needs and interpretation of assessment results.

Task 7: The development of a plan for determining appropriate sponsorship of training programs.

Task 8: The development of a plan for identification of training modules.

Task 9: The search to identify existing instructional materials which may contribute to identified training programs.

Task 10: The development of a plan by which module development should occur.

CONTRACT PERFORMANCE

The Vermont State Colleges, through its Office of External

Programs, has completed project work in complience with the contract. In doing so, one alteration was made, reported to the project officer, and approved.

The approaches of the Skills Needs and the Training Needs assessments sought two types of skills and their related training requirements: 1) skills generic to a range of jobs and 2) skills specific to a particular job. We identified greater needs for generic knowledge and skills and many common threads of knowledge which were required in those specific skills identified. In many ways, these assessments were conducted concurrent with one another. In addition, their results were of limited value because of contractual limitations to "no more than nine respondants" as well as other factors described later. Subsequently, the projects Technical Advisory Council saw greater benefit in development of a training delivery model rather than just the development and delivery of a couple of specific training programs. As a result, the brokering model described herein was developed with the approval of our project officer. In essence, the model brings Tasks 8, 9, and 10 together into one much broader, far reaching effort.

The project has been a satisfying experience for those associated with it. As a result of two site visits and regular telephone contact by the project officer, we have kept the contractor appraised of our progress and, subsequently been reinforced for our performance. Formal feedback from the project officer indicates satisfaction with our progress.

The Technical Advisory Council, which has been closely associated with all project activities, has not only expressed their enthusiasm for this project, but has unanimously elected to continue its "sheperding" the demonstration of the resultant brokering service model. Their insight, dedication, and contributions are largely responsible for the success of the project.

THE FINAL TECHNICAL REPORT

The report contained herein is prepared, ostensibly, to meet the requirements of the federal contract. Its purpose goes far beyond that motivation. This report should serve some value to potential providers and users of technical training in Vermont and other states. It will serve as a basis for further activites in Vermont. While, the form and sponsorship of such activities have not been identified, the results reported herein should provide insights to both successes and failures.

In addition to this introduction, this report contains seven other chapters and appendices:

Chapter 2 Project Setting

This chapter is included to give the reader some sense of the unique geographic setting of Vermont and a flavor of its educational and industrial residents.

Chapter 3 The New Industrial Revolution

A brief look at the changes facing our industrial workforce. This by no means represents a scholarly examination, rather a compilation of the various issues and concerns raised by those industries involved in this project.

Chapter 4 Project Processes

This is a summary look at those processes and activities which represent the project's work. For the sake of accuracy, the skills needs and training needs assessments are described in one section. These two activities were con-

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ducted concurrently.

Chapter 5 Project Findings

Several of the project's tasks involved collection and analysis of information and data. Chapter 5 summarizes the results of these tasks.

Chapter 6 Brokerage Service Model

The primary outcome of this project is the model described in Chapter 6. It represents the culmination of the project's early activities and sets the agenda for future work.

Chapter 7 Project Outcomes

There are many "intangible" outcomes associated with a project of this nature. Collectively, these outcomes may represent the most significant impact of this project on the state of Vermont.

Chapter 8 Conclusions and Recommendations

This chapter summarizes the preceding sections and takes a look at the needs of the future.

Appendices: There are a lot of summary documents which describe various aspects of this project. In retrospect, some of them are of little value while some have "appreciated" in value since their origination.

Chapter 2

PROJECT SETTING

Vermont, one of the New England states, is located in the northeast bordered by New Hampshire, Massachusetts, New York, and, on the north, by the Canadian Province of Quebec. It is a rural state covering 9,278 square miles. A unique and distinctive state, it has characteristics which give it a flavor and reputation all its own. Vermont's two major resources, its land and its people, interact in such a way as to set the state apart.

The very nature of the land -- mountainous, rocky , forested, cold and snowbound in winter, delightful in summer -- has shaped a population of industrious, frugal, honest, down-to-earth people. The very nature of it's people has driven them to develop Vermont into one of America's garden spots. The absence of billboards along its highways, litter of bottles and cans, and ticky-tacky developments is no accident. Vermonters have legislated it that way. The fact that Vermont is third in the nation in the percentage of its work force employed in high technology industry is no accident either. Industry has found, and reported to us, that the labor force in Vermont has excellent work attitudes, and is reliable, resourceful, hard-working, honest, and fair.

This High Technology Training Consortium project has aimed at identifying the training needed by that labor force and finding ways to implement that training. This called for a look at the "users" of that training, the employers and employees of our state, and the "providers" of that training, the secondary vocational schools, the colleges and universities, and the educational arms of organizations, both public and private, which are not considered to be part of the conventional educational establishment.

VERMONT'S POPULATION

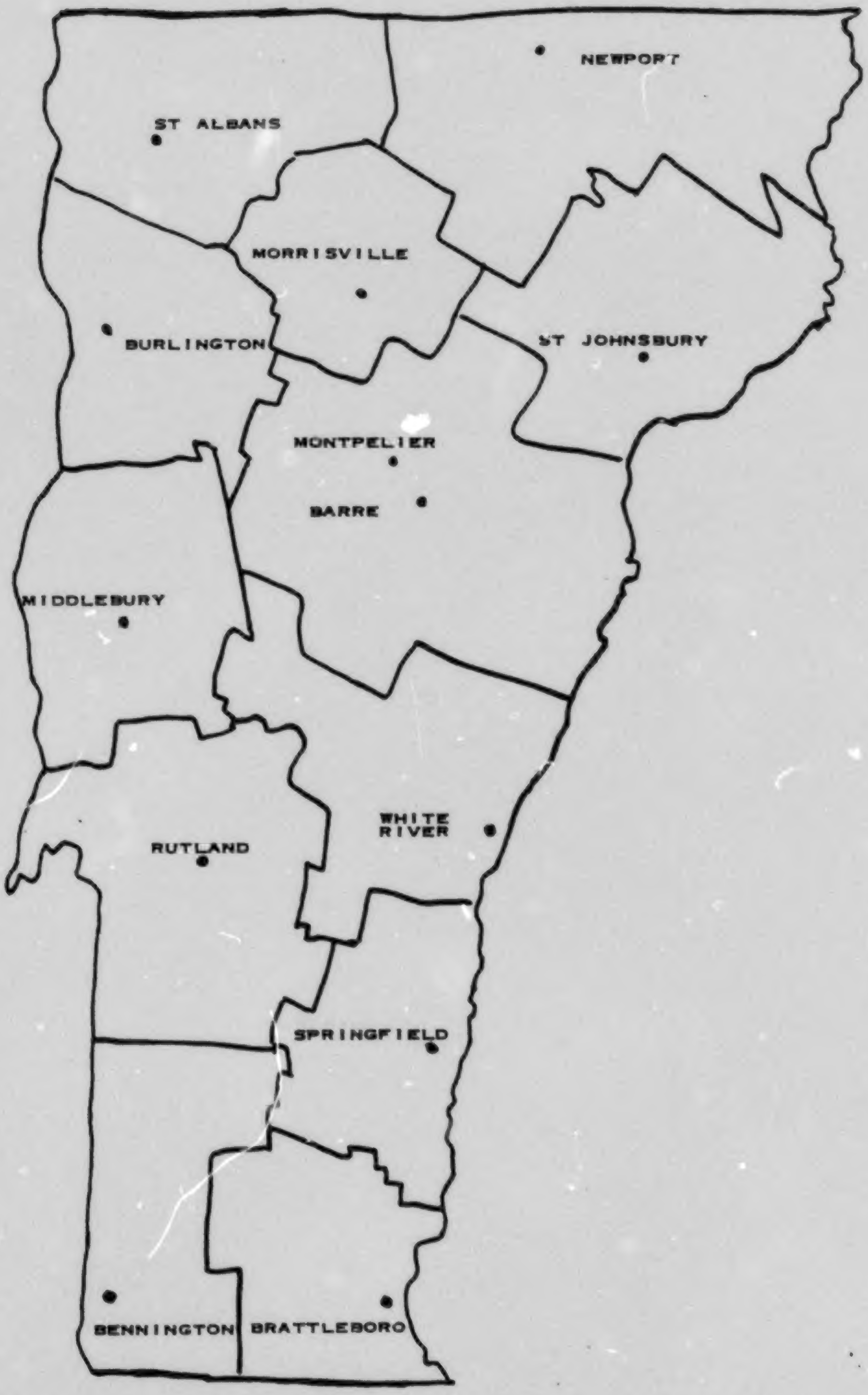
Vermont is small, both in geographic size and in population. The state is composed of fourteen counties and has twelve labor market areas, as illustrated in figure 2.1 According to the Bureau of the Census, the 1980 population of Vermont was 511,456. Burlington, the state's largest city (pop. 37,712), is situated in Chittenden County, bordering Lake Champlain. Only eight cities and towns had a population of 10,000 or more in 1980.

Between 1970 and 1980 Vermont's population increased 15%. Chittenden County, with a gain of 16,403 between 1970 and 1980, recorded the largest population expansion in absolute numbers. Windsor and Rutland counties, with gains 6,948 and 5,710 residents respectively over 1970, ranked second and third. Addison County also registered a noteworthy population expansion, growing from 24,266 in 1970 to 29,406 in 1980. Grand Isle had the smallest number of residents (4,613) in 1980.

The towns of Colchester and Essex in Chittenden County showed the largest percentage gains in population between 1970 and 1980,

FIGURE 2.1

VERMONT'S 12 LABOR MARKET AREAS


NEWPORT
ST ALBANS
MORRISVILLE
BURLINGTON
ST JOHNSBURY
MONTPELIER
BARRE
MIDDLEBURY
WHITE RIVER
RUTLAND
SPRINGFIELD
BENNINGTON
BRATTLEBORO

43.9% and 31.4% respectively. Seven major cities and towns recorded declines in population from 1970: Burlington, Rutland City, Brattleboro, Barre City, Montpelier, St. Johnsbury, and St. Albans City.

Such data on population by counties and cities becomes more significant when one considers the road and weather conditions in Vermont. For a considerable period of time in the winter travel is unpredictable because of mountainous terrain and weather. This greatly affects effectiveness when educational providers try to deliver programs for employers and employees over a wide geographical area.

VERMONT'S EMPLOYMENT

Vermont's labor force (current population survey estimates) experienced significant growth during the past decade, increasing from 188,750 in 1970 to 260,000 in 1981, a gain of 71,250 or 37.7%. The greatest percent increase in population between 1970 and 1980 occurred in the White River Junction and Morrisville areas. The Middlebury labor market area ranked third with an increase of 21.3% during the same period.

In recent years, the employment picture in Vermont has been relatively good; better than for the nation as a whole. Due to a year of improved economic conditions, Vermont's unemployment rate declined from 6.4% in 1980 to 5.7% in 1981. However, a predicted nationwide slowdown is expected to increase Vermont's unemployment rate for 1983 to around 6.1%. One area in particular has been hard hit by recent recessionary trends-- the Springfield/Windsor area in Springfield County. The dependence of this area on the machine tool industry has made it particularly vulnerable to the slowdown in manufacturing that occurred throughout the nation.

A look at Table 2.1 gives a picture of the employment spread, by industry activity, throughout the state of Vermont and projects this picture into 1990. Some changes are predicted for the employment trend in Vermont. As indicated in this table, Vermont's traditional agricultural base is expected to decline and manufacturing is expected to grow at a rate somewhat less than the average.

TABLE 2.1
EMPLOYMENT IN VERMONT BY INDUSTRY
1980 AND 1990

INDUSTRY TYPE	1980 Annual Average	1990 Annual Average	CHANGE Amt.	%
Agr., Forestry, Fisheries	6,100	5,677	-423	-6.9
Mining & Construction	10,813	14,350	3,537	32.7
Manufacturing	50,873	60,949	10,076	19.8
Durable Goods	37,019	46,794	9,775	26.4
Nondurable Goods	13,854	14,175	321	2.3
Transportation & Utilities*	10,517	12,050	1,533	14.6
Wholesale Trade	7,518	9,500	1,982	26.4
Retail Trade	33,263	41,950	8,687	26.1
Finance, Ins., &Real Est.	8,038	10,000	1,962	24.4
Services	66,925	82,892	15,967	23.9
Government	15,400	19,100	3,700	24.0
Federal, except Postal	2,777	3,200	423	15.2
State, except Education	7,878	9,900	2,022	25.7
Local, except Education	4,745	6,000	1,255	26.4
TOTAL ALL INDUSTRIES	209,447	256,468	47,021	22.5

* Includes U.S. Postal Service
Source: Vermont Department of Employment & Training

VERMONT'S INDUSTRY

The ingenuity, productivity, and skills of Vermont workers helped spark the industrial revolution in the United States. Now, more than ever, these qualities characterize the industry of Vermont. The state has developed a thoughtful program for economic development which allows the advantages of modern technology to walk hand in hand with Vermont's unique quality of life. There are over 49 regional and local development entities throughout the state actively working on behalf of its business and industry.

An indication that Vermont is a good location for industry is found in the fact that 43 national and international companies have one or more plants located there. Such a situation is good for Vermont's economy as well as for the level of technological capability of the state. The interchange of technological information through its association with larger corporate headquarters keeps Vermont industry abreast of the world's technological frontiers.

Typical of Vermont's industrial regions is the Springfield-Windsor area. This is an area rich in history and technological development: the Republic of Vermont was born in Windsor in 1777; the turret lathe, combination lock, adding machine, breechloading rifle, steam shovel, the "jointed" doll, and even the mop wringer were invented here.

With a background like that it is no wonder that in the towns of Springfield and Windsor, there exists one of the largest concentrations of machine tool manufacturing in the nation. Dubbed "Precision Valley", this area contains a highly skilled labor force. The major industrial and commercial centers of the region, each providing extensive municipal services necessary for industrial location are: Ludlow (population 2,463), Springfield (population 10,063), and Windsor (population 4,158). Besides machine tool production, the region includes a thriving talc mining industry, a growing recreational economic base, and several large engineering firms and manufacturing enterprises in fields such as textiles, computer hardware, shoe sales, plastic molding and milk processing products. Although the area has been hit by the national recession, recent announcements of new product developments give signs of improvement in the economy.

Another area worthy of note is the greater Burlington region, Vermont's major economic center and most urban area. The region encompasses the state's largest industrial and commercial firms, leading banks, five institutions of higher education and the third largest Medical Center in New England. Two secondary vocational-technical centers help to supply skilled manpoower to the county's rapidly expanding industry. An estimated three-fourths of Vermont's total labor force lives within commuting range. A combined student body of over 11,000 is found at the University of Vermont, St. Michael's College, Champlain College, Trinity College, and the Community College of Vermont. This concentration of resources makes for a unique human environment and is the reason the area is dynamic, progressive and one of the fastest growing in the country.

Other industrialized regions include the Central Vermont region, dominated by Montpelier, the state capitol, and Barre, a trade and industrial center; the Rutland region with an economic balance of manufacturing, agriculture and tourism; and the

Franklin-Grand Isle region with paper, electrical, food processing, and apparel industries.

Vermont does have its large manufacturing firms such as IBM, General Electric, Digital Equipment Co, etc. The twenty largest firms are displayed in Table 2.2.

TABLE 2.2
TWENTY LARGEST PRIVATE EMPLOYERS IN VERMONT
(in descending order)
AS OF MARCH 1983

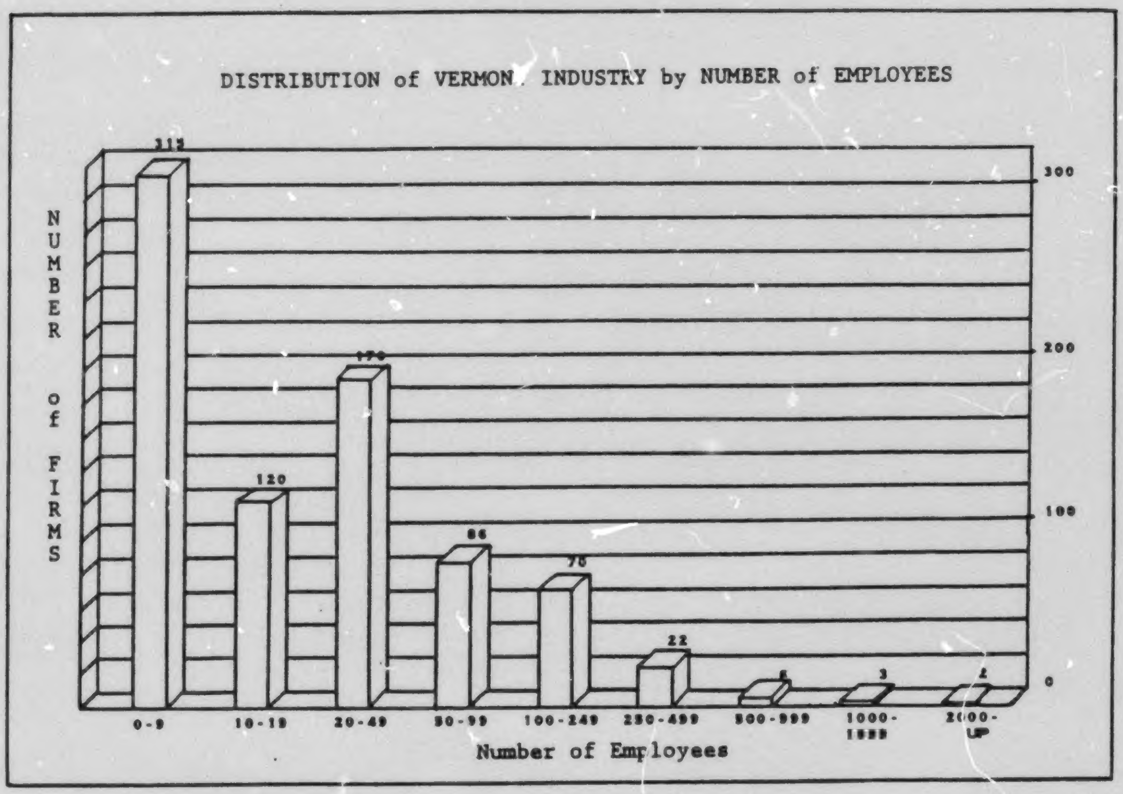
NAME & LOCATION(S)

1. International Business Machines Corp., Essex Junction
2. General Electric Co., Burlington, Rutland
3. Medical Center Hospital of Vermont, Burlington
4. New England Telephone, Various locations
5. Ethan Allen, Inc., Beecher Falls, Orleans, Randolph, Brighton
6. Grand Union Stores, Inc., Various locations
7. Simmonds Precision Products, Inc., Vergennes, Bellows Falls, Middlebury
8. Union Carbide Corp., Bennington, St. Albans
9. P&C Food Markets, Inc., Various locations
10. National Life Insurance Co., Montpelier
11. Rutland Hospital, Inc., Rutland
12. Central Vermont Medical Center, Inc., Berlin
13. Middlebury College, Middlebury
14. Sherburne Corporation, Killington
15. Digital Equipment Corp., So. Burlington
16. Norwich University, Northfield (includes Vt. College, Montpelier)
17. Chittenden Trust Company, Various locations
18. Saga Food Service of Vt., Inc., Various locations
19. Putnam Memorial Hospital, Bennington
20. Central Vermont Public Service Corp., Various locations

Source: Vermont Dept. of Employment & Training

For the most part, however, industry in Vermont is made up of small firms. 95.8% of the industrial firms employ fewer than 250 people and 87% employ fewer than 100. Information from the 1983 Official State of Vermont Manufacturer's Directory indicates a distribution of industrial size illustrated in Figure 2.2.

Figure 2.2



These firms range from very sophisticated, very specialized, high technology firms, such as New England Digital, Karl Suss America, Triad Design, etc. to the older, more standardized, but none-the-less successful firms, such as Burndy; York Capacitor; and Smith, Whitcomb & Cook. Table 2.3 shows the product mix and number of plants operated by Vermont's industry.

TABLE 2.3
VERMONT FIRMS BY STANDARD INDUSTRIAL CLASSIFICATION

SIC CODE	PRODUCTS	NO. OF PLANTS
20	Food & Kindred Products	70
22	Textile Mill Products	12
23	Apparel & Other Finished Products Made from Fabrics and Similar Materials	33
24	Lumber & Wood Products, except furniture	131
25	Furniture & Fixtures	35

26	Paper & Allied Products	21
27	Printing, Publishing & Allied Industries	129
28	Chemicals & Allied Products	25
29	Petroleum Products	10
30	Rubber & Miscellaneous Plastics Products	25
31	Leather Products	8
32	Stone, Clay, Glass, and Concrete Products	118
33	Primary Metal Industries	11
34	Fabricated Metal Products, Except Machinery, Transportation Equipment, and Non-electric Heating Equipment	46
35	Machinery, Except Electrical	73
36	Electrical & Electronic Machinery, Equipment and supplies	37
37	Transportation Equipment	10
38	Measuring, Analyzing, and Controlling Instruments; Photographic, Medical, and Optical Goods; Watches and Clocks	19
39	Miscellaneous Manufacturing Industries	32

Table 2.4 displays the top ten non-agricultural industries in Vermont ranked by their annual average employment. The sign at the right indicates whether the figure is an increase or a decrease from the 1981 figure. Thus, the shifting pattern of employment by industry can be discerned: decreasing government, increasing health services, increasing tourism, increasing education, and decreasing trade & industry except for electrical machinery.

TABLE 2.4
TOP TEN INDUSTRIES IN VERMONT
ESTIMATED NON-AGRICULTURAL WAGE AND SALARY EMPLOYMENT
1982

Industry	Annual Average Employment *	
1. Local Government	17,900	-
2. Health Services	15,300	+
3. State Government	13,400	-
4. Electrical Machinery Manufacturing	12,600	+
5. Eating & Drinking Places	11,100	+
6. Contract Construction	9,750	-
7. Hotels, Motels, Other Lodging Places	7,100	+
8. Educational Services	6,900	+

9. Non-electrical Machinery Manufacturing	6,500	-
10. Retail Food Stores	6,100	-

* Based on 1982 Current Employment Statistics
Source: Vt. Dept. of Employment & Training in cooperation with the Bureau of Labor Statistics, U.S. Dept. of Labor.

A look at measures of wages and income gives an indication of the economic health of a community. Analyzing the annual average wages in covered employment by county shows Chittenden County, the area of greatest industrial concentration in Vermont, to be the highest. Second is the machine tool industry area in Windsor county, and third is Essex County. These three counties are unique in that their levels are above the average for Vermont. All other counties are below the Vermont average of $11,840. A look at the per capita income shows Chittenden and Windsor counties still in the lead, but now five counties are above the Vermont average of $7810.

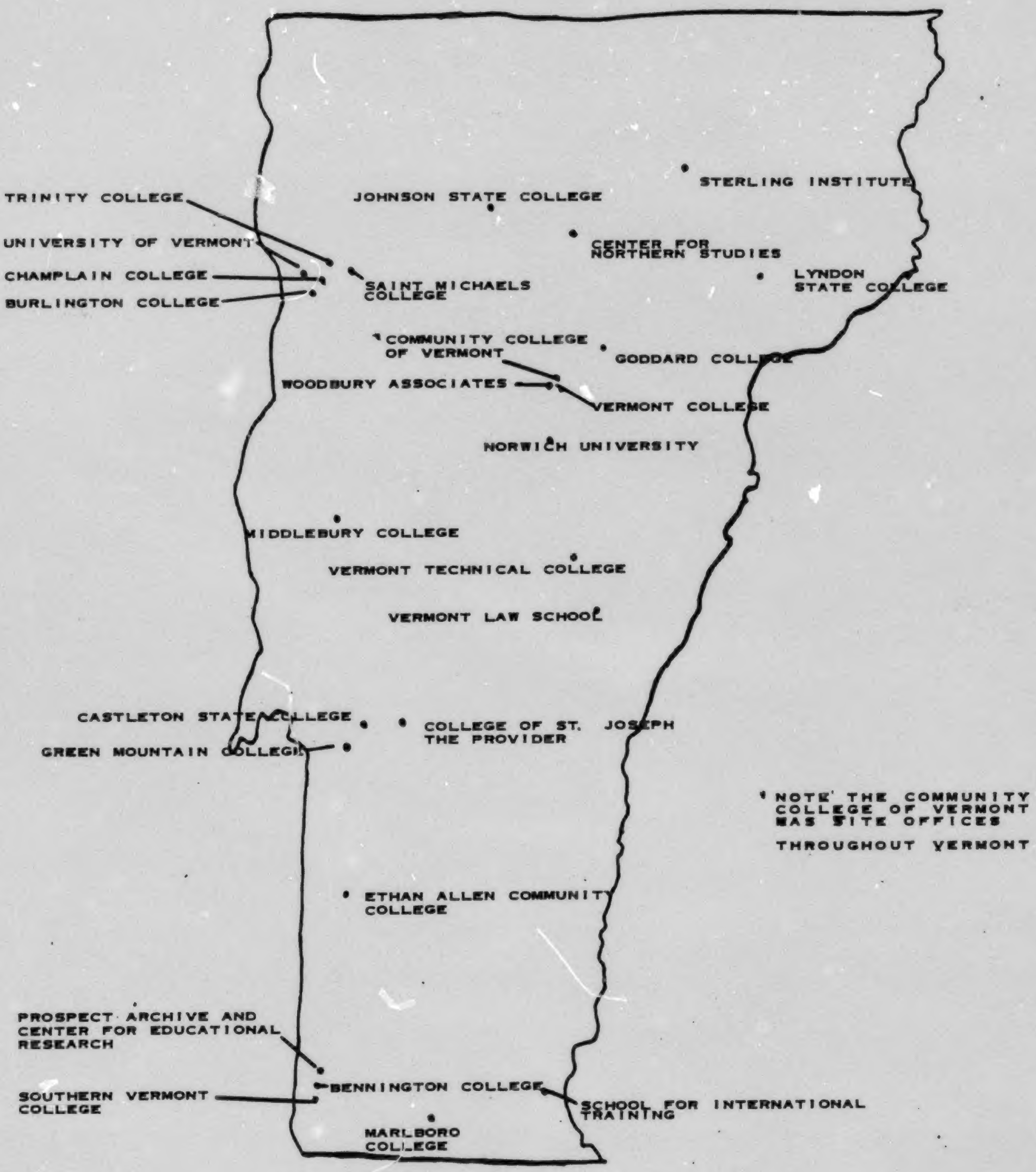
VERMONT'S EDUCATIONAL RESOURCES

Higher Education

The educational/training resources available in the State of Vermont are more numerous and of a higher quality than is readily apparent. For example, the University of Vermont Medical School enjoys such a reputation that students and scholars come from all over the world to benefit from it. Thirty-one post-secondary institutions are capable of delivering a broad range of education from individual courses through Associate to Doctoral degrees. The distribution of the higher education institutions is displayed in Figure 2.3. More than 3,000 degrees and certificates

FIGURE 2.3

VERMONT'S HIGHER EDUCATION INSTITUTIONS


STERLING INSTITUTE
TRINITY COLLEGE
JOHNSON STATE COLLEGE
UNIVERSITY OF VERMONT
CENTER FOR NORTHERN STUDIES
CHAMPLAIN COLLEGE
LYNDON STATE COLLEGE
SAINT MICHAELS COLLEGE
BURLINGTON COLLEGE
*COMMUNITY COLLEGE OF VERMONT
GODDARD COLLEGE
WOODBURY ASSOCIATES
VERMONT COLLEGE
NORWICH UNIVERSITY
MIDDLEBURY COLLEGE
VERMONT TECHNICAL COLLEGE
VERMONT LAW SCHOOL
CASTLETON STATE COLLEGE
COLLEGE OF ST. JOSEPH THE PROVIDER
GREEN MOUNTAIN COLLEGE
ETHAN ALLEN COMMUNITY COLLEGE
PROSPECT ARCHIVE AND CENTER FOR EDUCATIONAL RESEARCH
BENNINGTON COLLEGE
SOUTHERN VERMONT COLLEGE
SCHOOL FOR INTERNATIONAL TRAINING
MARLBORO COLLEGE

* NOTE THE COMMUNITY COLLEGE OF VERMONT HAS SITE OFFICES

THROUGHOUT VERMONT

are awarded annually by Vermont institutions to Vermonters as they complete their academic programs. The number of students enrolled in Vermont's colleges and universities is equivalent to almost 10% of the State's population. From traditional-aged students to the employed adults in continuing education, students are working to become better citizens and greater contributors to their communities. Over 45% of these students are from out-of-state, an indication of the extent to which Vermont exports education.

Vermont has an unusual system of higher education. It differs from those of most other states in the way it is financed, the way it is organized and coordinated, the sources of its students,and its importance to the state's economy.

Vermont's financing of higher education represents a "high tuition/high student aid" approach as compared to most other states. Its financial aid programs help Vermonters needing assistance to attend colleges, universities or other post-secondary schools, either in Vermont or elsewhere. This "high tuition/high student aid" approach to the financing of higher education may be the single most important characteristic of Vermont's higher education system setting it apart from those of other states.

The system has other important characteristics, some resulting from Vermont's unusual financing approach and others that are not directly related:

* Vermont's state-assisted post-secondary institutions are autonomous entities established as separate corporations and governed by independent boards. While they are not organized as integral parts of state government, they are responsive to its interests and concerns through the

Governor's and legislature's selection of board members and through continuing open discussion, reports, audits, and other communication.

- Vermont has no single governing or coordinating board with authority over all public institutions or, as in some states, all higher education institutions. The Vermont Higher Education Planning Commission is an advisory board with no authority over institutions. It seeks its goals through open discussion, by providing accurate benchmark information and analysis, and by seeking consensus among diverse groups and interests.

- Vermont's higher education system includes a large and diverse group of both independent and state-assisted colleges and universities which serve thousands of Vermont students and offer a wide range of educational programs.

- Vermont's colleges and universities, both state-assisted and independent, enroll large numbers of students from other states. Vermont leads the country in percentage of its total enrollment coming from out-of-state.

- A greater percentage of Vermont's young people leave the state to go to college or other post-secondary schools than is true in most states.

- A greater percentage of Vermont high school students graduate from high school than in most other states. However, a smaller percentage of Vermont high school graduates enter college immediately after high school than the national average.

- Higher education, considered as an industry, plays a more important role in the economy in Vermont than in any other state. Almost half of its students and two-thirds of its income are from sources outside the state. Each dollar spent in Vermont will change hands several times before leaving the state's economy. Economists call this the "multiplier effect." The generally recognized economic multiplier applied to educational expenditures within Vermont is 2.59. Education can be considered one of Vermont's major industries generating $500 million of business annually.

- Only five states appropriate smaller amounts of tax funds per capita of state population to support higher education through institutional support and student assistance. Only ten states use a smaller percentage of total personal income than Vermont to support higher education. However, Vermont has maintained and modestly improved this level of support through the current hard economic times while a number of states have been forced to curtail sharply their more liberally statesupported systems.

Indeed, higher education is one of the largest employers in Vermont totaling 15,500 employees. The economic impact of this is considerable. During the 1981-1982 academic year the 26 institutions had total revenues of more than $244 million.

Secondary Vocational Education

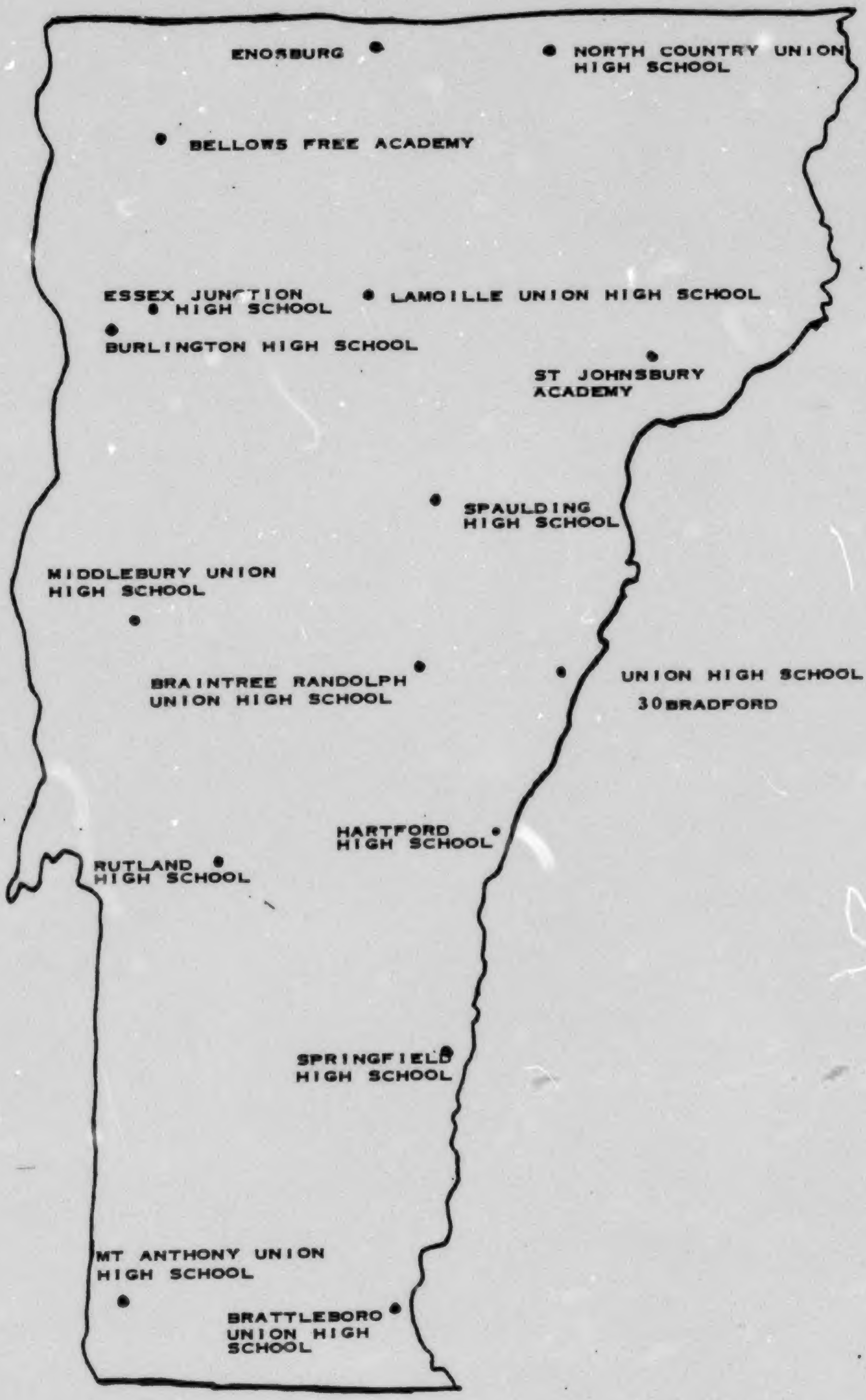
Vermont has already invested a considerable amount -- $27 million -- in the creation of a system of area vocational centers. Sixteen are located around the state (see figure 2.4). Most centers are attached to centrally located high schools and serve other schools systems within a designated service area. In addition to the 16 area vocational centers, the state provides financial support to a limited number of trade and industry, health, and human services programs in regular high schools.

In 1981, state funded vocational education programs served 45% of all Vermont juniors and seniors. Around 30 % of these 7200 students attended area vocational centers on a half-day basis, commuting from high schools within the service areas. Ten percent of area vocational center students were handicapped and roughly 25% were either educationally or economically disadvantaged.

Follow-up studies of students one year after they completed secondary vocational education programs indicate that 93% of the students available for job placement were employed and 59% were employed in the field in which they were trained. Also, 18% of the students not available for job placement went on to further education.

FIGURE 2.4

SECONDARY AREA VOCATIONAL-TECHNICAL CENTERS


ENOSBURG
NORTH COUNTRY UNION HIGH SCHOOL
BELLOWS FREE ACADEMY
ESSEX JUNCTION HIGH SCHOOL
LAMOILLE UNION HIGH SCHOOL
BURLINGTON HIGH SCHOOL
ST JOHNSBURY ACADEMY
SPAULDING HIGH SCHOOL
MIDDLEBURY UNION HIGH SCHOOL
BRAINTREE RANDOLPH UNION HIGH SCHOOL
UNION HIGH SCHOOL
30BRADFORD
HARTFORD HIGH SCHOOL
RUTLAND HIGH SCHOOL
SPRINGFIELD HIGH SCHOOL
MT ANTHONY UNION HIGH SCHOOL
BRATTLEBORO UNION HIGH SCHOOL

In 1983, more than $13 million was expended for operating the secondary vocational education system. Nearly $7 million came from combined state and federal funds and over $6 million from local school districts.

Currently, Vermont vocational education enrolls nearly 13,000 students in its secondary programs and an additional 7000 in its post-secondary and adult programs. The distribution of vocational programs is shown in Figure 2.5.

Figure 2.5
Programs offered at Vermont Area Vocational Centers

	Barre	Bennington	Bradford	Brattleboro	Burlington	Enosburg	Essex Jct.	Hartford	Hyde Park	Middlebury	Newport	Randolph	Rutland	St. Albans	St. Johnsbury	Springfield
Agri-Business and Natural Resources	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
Distribution	x	x			x			x		x	x		x	x		x
Health Occupations	x	x	x	x	x		x	x		x		x	x	x	x	
Occupational Home Economics	x	x	x	x	x	x	x	x	x	x		x	x	x	x	
Office Occupations	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Trades & Industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Reports from Vermont employers indicate general satisfaction with the quality of education and training services provided by our institutions. Most concerns focus on limitations in the quantity and distribution of such services. This condition produces a sense of bewilderment: "Why is such an excellent educational resource seemingly so underutilized and inequitably distributed in the area of industrial training and contribution to economic development?"

Utilization of Education

One can uncover many reasons that these resources are not utilized more effectively. The institutional perspective suggests funding. The public support of education in Vermont is well below the national average in almost every way. For example, in supporting its public higher education, Vermont regularly ranks below at least 45 other states in terms of dollars appropriated per capita. In short, public educational organizations find funds barely adequate to support the programs of their primary mission. For example, an area vocational center receives state appropriation for its daytime, secondary activities. To require further utilization of the facility (to say nothing of the instructional resource) increases an administrative burden for which there is no mechanism for financial support. In short, "we're having enough trouble doing what we're required to do with so little money."

The industrial perspective suggests a different reason that the educational resources are underutilized. Industry has often considered the state's educational resources to be inappropriate, unresponsive, and inflexible. These characteristics manifest themselves in a variety of statements which include descriptions such as: ivory tower, out-of-touch, antiquated facilities, out-of-date programs, too much faculty self-protection, too bureaucratic, etc. In many cases, industries have gone to great expense to conduct their own training and, in many cases, general education programs.

Therefore, the situation approached by the High Technology Training Consortium project reveals a definite need for high technology training, an excellent resource for meeting that need, and a rather wide chasm of understanding between the "users" and the "providers" of that training -- fertile ground for the work of the project.

Chapter 3

THE NEW INDUSTRIAL REVOLUTION

Its all very confusing--what will the effect of high technology be? Hypotheses are often contradictory; reactions are often counter-productive. Do we need a better trained workforce; or do we need any workforce at all? The only response which appears universal is: "High Tech" is here and going to continue! But what is it?

THE KNOWLEDGE REVOLUTION

Two definitions of "High Tech" seem to have gained acceptance. The first relates to specific kinds of industry and products, the second to less specific production processes.

Certain industries base their entire business operation on the application of pure science. That this application results in useful and/or desired products is the result of significant investment in research and development. This type of industry is heavily reliant on a well-educated workforce including scientists, engineers, and technicians. A common characteristic of its product is "high value added," usually as the result of the application of knowledge rather than tools. Frequently, the product is compact and increasingly dependent on micro-processors. The general public usually thinks of the computer and electronics industries as "High Tech," but that label applies in a multitude of other areas from chemicals to transporation to machine tools.

Perhaps, the other definition of "High Tech" is of greater significance. For the foreseeable future, much of our national economy will still be dependent on the manufacture of "tooled" products. In order to increase productivity and compete in the world market, manufacturers must exploit the potential of higher technology-based design and production processes. This will include a dramatically greater use of robotics, computer controlled machinery, and computer aided design. This broad application is frequently called CAD/CAM--Computer Aided Design/Computer Aided Manufacturing. This development will radically alter the characteristics of the American production worker; these changes will be continuous and irreversible.

A common thread through both definitions is the change from a skill-based production to a knowledge- or concept-based production. Its requirements for workforce preparation through education and training are, seemingly, overwhelming.

THE EFFECTS ON HUMAN RESOURCES DEVELOPMENT

To understand the implications of this technical revolution, it is important to agree on a view of human resources development. Frequently, Leonard Nadler is cited as a spokesman for this field. In general, Nadler describes human resources development in three activity areas: Training, Education, and Development.

The major focus of training is to enable an employee to perform better on the present job or one related to it. Training focuses on a particular goal that is specific in nature and outcome. The training may be for skills, knowledge, methodologies, or attitudes. But training differs from education in the specificity of the goal and the focusing of all behaviors toward that goal. In short, training is job-oriented.

When a worker is being prepared for a place in the organization different from the one currently held--this is employee education. It is frequently geared to specific job placement at some time in the future. Education seeks to achieve broader goals of less certainty. A primary purpose of employee education is to prepare employees for upward mobility within the organization. Employee education is individual-oriented.

Both training and education have identified directions for the individual. Employee development is concerned with the future direction of the organization and the employee in directions not clearly identifiable. The goals of employee development cannot be stated in specific or behavioral terms. Within an organization, employee development activities are designed to produce a viable and flexible workforce--for rapid deployment as organizational needs change. Employee development is organization-oriented.

Historically, American industry has focused its human resources development activities at the training level. This may be very appropriate for the skill-based production which has been prevalent in industry. But as industry moves toward an environment of constantly and rapidly changing technologies and production processes, an increased dependence on employee education and development will be required. Training, in the sense Nadler defines it, will rapidly be replaced by programming of computer controlled machines. Preparing a workforce for the jobs in an automated workplace will demand more knowledge- and concept-based preparation. This is the gauntlet "High Tech" has thrown down.

THE EDUCATIONAL CHALLENGE

As we attempt to meet this educational challenge, several directions are immediately evident. As we progressed in this project, we found some addressable now, others requiring some building of foundation.

To meet this challenge will require resources far greater than any one source can provide. The effort must elicit the cooperative, coordinated efforts of all levels of education, government, industry, labor, and community. Each component has something to offer as well as a significant stake in the outcome. The primary focus of this project has been on "cooperative" and "coordinated." Heretofore, the components have communicated in fragmented, often counter-productive ways. To have provided a forum for common communication is of great significance.

Our traditional education systems, both primary/secondary and higher, must internalize their role and responsiblity in economic development. That is not to suggest a singular orientation, but, rather, a recognition of its relative importance. In Vermont, economic development is governed by a philosophy which preserves the importance of our natural and human resources.

Within this preservation orientation, educational participation takes on added importance.

Just as innovation is the mark of higher technologies, it must also play a role in the meeting of these educational and training challenges. We still tend to think of innovative delivery in traditional educational terms. Yet, geographic and demographic conditions detract from the economic and educational viability of these methods. While they should not be abandoned, they should be augmented by experimentation and, eventually, exploitation of technological advances in communication. The education and training enviroment should encourage such innovation and reward its successes.

It is important that we constantly consider two offensives. First, is the improvement of education and preparation of future citizens and workforce. Secondly, the continual "retooling" of our current workforce must include the new "basic knowledge" required in the evolving workplace and the delivery of education/training to avoid future deficiencies.

This mammoth and continuous task of educating our current workforce is the focus of this project. We have taken firm, deliberate steps toward the needed capabilities.

Chapter 4

PROJECT PROCESSES

A variety of tasks have been undertaken, each contributing to the project's goals. Each of these tasks produced important results, whether tangible or not; but the progression of tasks led to the development of the brokering system model. The project, in essence, was "process" in nature. It represented a brokering system in its earliest of stages. The resultant "formalized" brokering service model is one of the major outcommes of the project.

Following is a brief sketch of the tasks specified in the contract. (They are followed by more complete descriptions.)

- Establishment of a Technical Advisory Council

  The Technical Advisory Council demonstrates two significant aspects of this project. First, the Council contributed greatly by advising and participating in the project's work. And, the very existance of such a council, blending the perspectives of education, industry and government (among others) represents a forum for exchange of information and common efforts characteristic of "brokering" in its broadest sense.

- Identification of Other Key Resources

  Throughout this project, the staff of the Office of External Programs had contact with representatives of over 100 industries in Vermont. Continuous participation in project activities and input of ideas from industrial representatives, vocational directors and many others from education and government complemented the work of those actually named to the Technical

Advisory Council. These resources will be key to any further development of the brokering services.

- **Assessing the Need for Skilled Workers**

  Skills assessment involved the expertise of many people and organizations. Personal contact with those industries expressing training needs represented the most significant aspect of this task. The assessment resulted in few quantitative results, but the descriptive nature of the results, when combined with the quantitative measures undertaken by state government, accurately portrayed the "felt needs" of Vermont's industrial base.

- **Assessing the Need for Training Programs**

  The project progressed to appreciate the tremendous needs for generic training. This need for a "trainable workforce" was expressed time and time again by the industrial members of the Technical Advisory Council and by much of the industrial community. In addition, there remains a constant need for assistance with job specific training, particularly among smaller companies. Within the constraints of the contract, we were able to identify many of these needs.

- **Determining Appropriate Sponsorship**

  It is at this point that the project became much more formative. The instructional capabilities of Vermont's institutions of higher education, system of sixteen secondary area vocational centers, and other training/education providers were collected, analyzed and made available. Our intent was to articulate the supply side of the training marketplace. Institutions often do not avail themselves of the many opportunities to promote training services. The project's intent was to create an environment which modifies and rewards the behavior of providing a broader base of services.

- **Creating a Delivery System Model**

  It seems shortsighted to identify training needs and mount little effort to solve them. The project and its advisory council saw a far greater responsibility and opportunity to develop a model by which specific training needs could be identified, searches for resources conducted, and appropriate training provider(s) matched to the need. A brokering service model was developed and adopted by the project as a mechanism to meet this goal.

THE TECHNICAL ADVISORY COUNCIL

Among the first, and very significant, tasks undertaken in this project was the creation of the Technical Advisory Council. The Council was formed to provide advice and creative thinking for the project. It has proven to be that and more. The Technical Advisory Council lacks any formal enpowerment; yet its impact and influence has been very significant in this year when interest in high technology and the training of the nation's workforce has been so widespread.

Technical Advisory Council Membership

In October 1982, a letter was sent to a broad range of groups potentially interested in the project. Among those to whom correspondence was directed were nearly 100 industries which currently are considered "high tech" in either product or manufacturing process or were likely candidates to adopt more highly technical manufacturing processes. This represented a cross-section of Vermont industry in size and geographic distribution. Letters were also sent to the commissioners or secretaries of the several state agencies actively involved in Vermont's training activities; the state labor organizations; institutions of higher education; and advisory councils or organizations related to vocational/technical education.

The letter invited nominations to the Advisory Council. The response was very impressive. Thirty-four organizations responded with over 37 nominations. From these nominations, the Chancellor of the Vermont State Colleges and the project director invited participation of 19 persons representing the diverse perspectives of:

- business and industry
- public broadcasting
- organized labor
- public higher education
- private higher education
- vocational education
- state department of education
- state agency of development and
- the state legislature

Ten of nineteen members were from business and industry. In selecting industrial representation, we sought a balance of perspectives, including company size, geographic distribution, type of manufacturing or service, and product lines. We also sought a broad distribution among executive, engineering, personnel, and manufacturing perspectives. We invited participation on the basis of professional contribution rather than representation of employer.

All invitations were accepted. The Council's membership is listed in Appendix I.

The Council's Operating Procedures

The Technical Advisory Council met five times during the contract period. The level of involvement and enthusiasm of the council members and other interested parties never failed to exceed our expectations. It has been a truly influential group.

The Council chose to act in an advisory capacity and leave the policy and decision issues to the contractor, the Vermont State Colleges. The Council considered a number of working models, including steering committee, task forces and others, but instead chose to work as one Council during the early stages of the project. The Council also chose to work by consensus as it provided advice to the project staff, the Office of External Programs. And finally, the Council asked to meet monthly, rather than quarterly, although eventually, several factors reduced this frequency to something approaching quarterly with subcommittee activities between meetings. Summary reports of all meetings, supplemented by frequent staff visits and telephone conversations kept Council members continuously informed and involved in project activities.

Inasmuch as the focus of this project was the "opening up" of the training system(s) in Vermont, it was important to encourage the participation of people not actually sitting on the Council. Frequent visitors to the Council's meetings represented a number of state agencies, local development groups, educators, legislators and the news media. All materials were made available to visitors and each received an advance agenda for future meetings. Several of the visitors actively participated in discussions and were asked to participate in subcommittee activities. Their contributions, as well as those of other visitors, were considerable.

Council meetings in January and March concentrated on the skills and training assessments. Early in that process, the Council asked that a preliminary polling of companies be conducted to help refine the instrumentation. They volunteered their own employers for this task. The Council consistently urged that the project be equally concerned with (1) the long-term challenge of preparing a "trainable" workforce in Vermont and (2) the training needs of the present "generation" of Vermont workers. The Council instructed the Office of External Programs to proceed with the assessments. A preliminary report was presented at the March meeting, and the Council designated a subcommittee to analyze the incoming data. The Office of External Programs presented the assessment reports at the Council's May meeting, at which time the Council agreed with our opinion that the needs and training assessments were of relatively little quantitative value, but contained useful descriptive elements to be used in concert with other quantitative studies as indicators of industry needs.

During its May meeting, the Council took several significant actions:

- The staff presented federal and state legislative and grant initiatives which related to high technology and related training. The Council suggested other parties which would be interested in such information and asked the Office of External Programs to continue to act as a clearinghouse for such information.
- The development of a brokering service model was adopted as the developmental focus for the remaining tasks of the contract. Basic elements of such a model were agreed to and a subcommittee selected to provide input to the its development.
- The Council agreed to co-sponsor a High Technology Conference to be held at Norwich University in August. Furthermore, the Council agreed to hold its next meeting concurrent with the Conference.
- The Council adopted "Four Areas of Future Emphasis" as the directions of its future work. These provide a philosophical base from which to mount future efforts.

The Council met in August for its final session under the contract. The meeting, held concurrently with the High Techology Conference at Norwich University, resulted in two significant actions:

- The Council adopted the brokering service model and expressed its hope that such a service could be demonstrated as a single source for training services--industry looking for "one-stop shopping" and educational resources looking for non-duplicative and unbiased access to the industry and training market. Each saw the brokering service as a valuable mechanism for achieving those goals.
- Contemplating its future and the results of its efforts, the Council elected to continue its work. Acknowledging the decrease in staff support, the Council chose to oversee demonstration and eventual implementation of the brokering service model.

Areas of Future Emphasis

Midway through the project, the Technical Advisory Council adopted four areas of future emphasis. These are significant in that they form a foundation for the work of the project, perhaps more significantly, they set a tone which was echoed in the work of other groups and organizations.

Math and Science

The math and science preparation of the current and future workforce, including:

- excellence in primary, secondary, and post-secondary education
- broad-based availability of remediation for the current workforce
- faculty and teacher development and retention

Institutional Capability

Increasing the capability of Vermont's educational and training institutions to conduct technical training. This includes lab/shop facilities as well as faculty and teachers and involves:

- legislative initiatives
- assistance with the high start-up costs of technical programs
- overcoming severe deficiencies in lab/shop equipment
- overcoming shortages of qualified teachers and faculty in key content areas

Distributed Delivery

Removing the barriers and creating the incentives for dispersed delivery of training programs. It is essential to create an environment which motivates institutions to develop and distribute programs more responsively. This requires consideration of:

- the high cost of delivering programs in the absense of a critical mass of participants
- the financial incentives and barriers
- the political incentives and barriers
- partnerships
- generating new delivery options

Brokering Service

Facilitating the match between capable providers and the training needs of new and existing industry. Brokering must provide for:

- equitable access by all potential providers and users
- rapid response time
- determination of vendor by user of service
- financial support of the brokerage

Impact of the Technical Advisory Council

The effectiveness and impact of the Technical Advisory Council extends far beyond the outcomes of its meetings and the decisions described above. The Council represented a first-of-its-kind, regular gathering of industrial, union, educational, governmental and political interests for meeting training needs. The uniqueness of this gathering is demonstrated in the enthusiasm and constant contribution of its membership. Additionally, the Vermont State Colleges Office of External Programs provided frequent opportunities for informal discussions and contact. In several instances, training programs eventually offered by other departments or institutions were conceived at informal gatherings.

Association with the Council fostered relationships which have contributed greatly to the training opportunities in Vermont. The Council, recognizing a possible exclusionary tendency in these relationships, has sought their deemphasis through the brokering service model. Nonetheless, the Council provided a forum at which training frustrations could be discussed, often resulting in recommended solutions.

Forum for Communication

Members have frequently characterized the Council as a very significant forum for communication. As such its various constituencies have shed their protective "skins" and addressed the training problems with decreasing concerns for ownership. What is at stake is making resources in Vermont work for Vermont. There now exists a better appreciation of the characteristics and philosophies of all constituencies. Whether tolerance or utilization will follow remains to be seen, but the lines of communications have been opened, the discussion placed on the table, and the benefits of coordination and cooperation displayed.

For this type of activity to succeed, we think it is essential to encourage and welcome the participation of individuals and organizations without formal representation on the council. As suggested earlier, ours is an effort to open up systems. We have encouraged the contributions of many people and groups; we have incorporated their input when we felt it was appropriate, and learned from it at the very least.

The Technical Advisory Council and its entourage of interested parties have influenced the directions of training in Vermont. Its dedication is demonstrated by its committment to continue operating after the contract period ends. It hopes to continue to influence the quality and availablity of technical training and preparation of Vermont's workforce. The Council's plan to continue demonstrates its desire to work toward that end.

IDENTIFICATION OF RESOURCES

The identification of resources available to the project, both from within and outside of the state of Vermont, began before the project was formally undertaken. The Vermont State Colleges Office of External Programs began collecting information on the high technology interests in the state. A list was contructed of the Secretaries and Commissioners of those state agencies and departments most involved in technical training. Another list was constructed of the business and industry in Vermont which had a high technology product or was considered a likely candidate for adoption of improved technological manufacturing processes. Publications, letters, and material dealing with high technology were directed into the Office of External Programs. and a library on technical training was started.

Among the first activities of the project was the solicitation of nominations for the Technical Advisory Council. In addition to the those nominated, we requested organizations to indicate other peoplle who might provide the project with some future resource. The 34 responses to this request resulted in 37 nominations for the Council and 61 recommendations of resources.

As the work of the project progressed additional contacts were suggested by Council members and others. As word of the other related activities came in, contacts were made. Information was collected from projects in South Carolina, Georgia, Ohio, New York, Massachusetts, Michigan, Illinois, Florida, New Jersey, New Hampshire, and the Western Interstate Commission for Higher Education (a consortium of 13 western states).

Personal contacts were made with many agencies of state government, including the Agency of Development & Community Affairs, the Department of Education, the Department of Employment & Training, and state planners and researchers. Quasi-public agencies were also contacted, for instance, planning and development commissions and chambers of commerce. Private training organizations were invited to contribute as they made themselves known.

Among the most valuable of resources to the project were the resources resident in Vermont's industry and educational institutions. Many contacts were made here by personal visit, telephone, and mail. The response has been very encouraging, revealing a deep concern over the need for training in the state and a willingness to cooperate in the pursuit of solutions.

It can be honestly said that more resources were identified than we were able to take advantage of in the short duration of the project. The invaluable services rendered by the Technical Advisory Council and others in Vermont's industry, education, and government have made these our most valuable resources.

ASSESSMENT OF SKILL AND TRAINING NEEDS

The project realized the limitations of our assessment capability and, consequently, sought advice from governmental agencies involved in similar efforts, educators who have an understanding of training methods and problems, and industry representatives who are close to the need for specific skills and training programs. From the outset, an effort was made to benefit from information already developed and to format our assessment to be compatible with statistics gathered and reported by the Research and Statistics section of the Vermont Department of Employment and Training. Since their studies make projections to 1990, we used that date as a benchmark for our inquiries to industry. Because of the limitation on sample size, it was essential that we be able to integrate our information with theirs. Consequently, our inquiries sought only to establish a descriptive "felt needs" component to complement their broad statewide statistical base of more definitive, quanitative information.

The Vermont Occupational Information Coordinating Committee (VOICC) was very helpful in facilitating our consultation with the Department of Employment and Training. The Research and Statistics section offered the assistance of their data banks and their guidance in planning the format for our assessment inquiries.

The Technical Advisory Council, both individually and collectively, was extremely helpful in communicating ideas and suggestions. Early input from the Council formed the basis of the instruments used to assess the skill and training needs of industry.

Methodology

After first obtaining advice and guidance from the Research and Statistics section, we asked the Technical Advisory Council industrial representatives to pilot test portions of the instrument by identifying the top five job needs (with skill descriptions) they felt were generally most important to Vermont's technologically-based industry. Their responses provided a base list of 25 jobs important to this small, yet fairly representative portion of Vermont industry. These are presented in Appendix II. A review of these might give rise to the question, "Are these high technology jobs?" Not necessarily; we were looking for the high technology-related training needs in Vermont. It is felt that each of the jobs listed will require some training in the use and maintenance of modern high technology equipment. Therefore identifying the job titles that figure importantly in the need for high technology training was a critical step.

We established criteria for the sample group as industry with either highly technical products or employing higher technological manufacturing processes. We conducted a preliminary telephone screening of 61 companies in twelve different Standard Industrial Classifications (SIC). Forty-two of these companies felt they needed high technology-related training and were willing to participate in the assessment. We proceeded to sample groups of nine or fewer companies in six SIC groups. The rates of return are shown in Table 4.1.

TABLE 4.1

SURVEY RETURNS BY SIC CODE

		COMPANIES		
SIC	PRODUCTS	SENT	REC'D	RETURN
28	Chemical, Allied Products	5	1	20%
33,34	Primary, Fabricated Metals	4	4	100%
35	Machinery, exc. Electrical	9	8	78%
36	Electrical/Electronic	9	5	56%
38	Instrument and related	6	5	83%
--	Other	6	5	83%
	Overall	42	29	69%

A survey conducted within our contractual limitations on sample size cannot be considered either reliable or valid if used as a "sole source." Rather, the survey results are considered an indication of "felt needs" as expressed by a relatively representative sampling of this sector of Vermont industry. Additionally, these results add a descriptive component to the far more reliable and valid studies conducted by the Research and Statistics section.

The Technical Advisory Council appointed a subcommittee to analyze the data gathered from the skills and training assessments, identify the training/education needs expressed or implied in the data, and develop a list of the appropriate training to meet those needs. It was at this point we fully realized the quantitative limitations of the data collection. The subcommittee work did result in two important products: (1) the report of "felt needs" which grouped job titles and skills needs and pointed toward some of the broad training/education needs and (2) the articulation of areas of future emphasis for the Technical Advisory Council.

In the meantime, the job list was checked against the Office of Employment Statistics (OES) occupational titles and definitions and the appropriate numbers were identified. Where OES numbers were not available, they were developed from the Dictionary of Occupational Titles. This list of jobs with the associated identifying numbers was sent to the Research and Statistics section of the Department of Employment and Training with the request that job openings to 1990 be projected for each job from the broad base of data available to that office.

The Research and Statistics section responded with a newly published report giving their projections of job openings in Vermont to 1990. This report gave only job titles without identifying numbers and did not cover all of the job titles on our list. Upon query, we were told that the Research and Statistics section could not develop projections on the federal identifying numbers we had given them because their data was a mixture of both federal and other data. Faced with this situation, we have tried to align our job titles with those of the report as closely as possible and have given the projections available.

Confidentiality

Within the developmental orientation of this project, we felt the need to ensure confidentiality among industry respondents. This was essentially done by allowing anonymity of assessment responses. If this sort of assessment is conducted in the future, its value will be greatly enhanced by a confidential coding of responses.

Many of the training needs we identified were not company-specific. However, many of the critical needs were specific to a company or a group of related companies. If the brokering service model is to be successfully demonstrated, data must be gathered in a manner which allows company identification. This can and should be done with full cognizance of the proprietary nature of some of the information.

Through this project, we have become convinced that industry wants a mechanism by which their training needs can be identified and met. Frequently, similar skills and training needs must be met among several of the smaller companies collectively. In order for the brokering service to collect these similar needs and formulate a response, information of a more specific nature keyed to specific companies must be maintained.

Whether industry will respond with sufficient candor and trust the confidentiality will be known only in time. We are convinced that the necessary level of trust can be developed and maintained.

APPROPRIATE SPONSORSHIP

In as much as our orientation to training development has been systematic rather than program specific, the determination of appropriate sponsorship should also be systematic in nature. Indeed, in the brokering service model adopted, the actual determination of the "appropriate" provider of some specific training program will be made by the USER. A mechanism by which the broadest participation might be promoted seems appropriate. It is with this perspective that we have conducted an examination of potential providers.

Methodology

The Office of External Programs has conducted a mail survey of the post-secondary and vocational education organizations in Vermont. The purpose of this mailing is for these institutions to select those content areas for which they would like to receive Requests for Proposals. This is a process that should be conducted on a regular (annual or semi-annual) basis. It alerts training/education organizations to the types of content areas for which training is being requested and allows them to specify those areas for which they either have or are developing expertise. In preparing the list of areas, we contacted other programs involved in non-collegiate education and training. What we found was that industrial-related topics were only a few among many, many areas. It seems the need is equally present in areas from law to health care. We see the brokerage as a valuable service to the broadest range of organizations.

To date, we have contacted the directors of the sixteen area vocational-technical centers, thirty-one post-secondary institutions, and six other private or public organizations which are likely to have a training resource available. In many instances, the mailing was followed up by telephone calls or a visit by project staff. We have asked the organizations to indicate those content areas for which they have instructional resources and/or facilities which are appropriate and available (see Appendix VI). Also, we have asked that contact persons be indicated for specific content areas. Again, the periodic update of data for a particular organization will be quite important.

We have not asked for this information with the intent to be at all exclusionary. Rather, we want an organization to indicate any and all areas for which they are interested. Our intent is to mail only those RFP's which will be of interest to an organization and not desensitize it by a deluge (large or small) of inapproporiate proposal requests. The feedback to this approach has been overwhelmingly positive.

In order to keep staff time to a minimum, our intent is to use a database management system which will automatically address RFP letters to the correct contact person in an organizations. We would require brief RFP's, proposals and response periods.

DEVELOPMENT OF A DELIVERY MODEL

Rather than become invested in specific training programs, the Council felt that an increased capability to respond to ever-changing training needs was much more critical. Therefore, this model is directed at changing the institutional environment rather than changing the institutions. To date, the present environment or marketplace has not motivated educational institutions to responsiveness. In fact, there is no reward for being more responsive. The cost of new, responsive programs must be borne "out of the hides" of existing programs which are important for other reasons. But also, there is a great deal of education and training that industry is willing to purchase. Industry is paying a premium to do its own training when its primary business is something quite different. In the same way that most industries would rather hire a catering service than to equip and operate a full cafeteria, most would rather purchase their education and training from "experts" in that field.

Consequently, an effort must be made to create an environment which motivates, utilizes, and rewards our institutions to invest in the facilties, instructional resources, and expertise to become a more valued part of the training equation. Concommitantly, the industrial sector must see a service which, in the end, costs less, is easier and less time consuming to use, and which is effective.

The Project has developed a brokering service model which, we believe, begins to create such an environment. As the Office of External Programs began development of such a brokering service model, it formed a subcommittee of the Technical Advisory Council comprised of members from education and state government, including several individuals who, though not members of the council, were active in its meetings. This group explored many of the programmatic and political issues of a brokering service. Its work was extrememly influential in creating the final form of the brokering service. The model described in Chapter 6 aims to opens up the market so that more institutions can see the quantity and nature of services requested and potential sources of revenue. It also creates a valuable level of competition in which those with fewer capabilities no longer see themselves excluded from participation. Indeed, they may be motivated to see the value of their unmarketed wares and venture forth in new ways.

The model makes no assumptions of what organization(s) play particular roles. It is conceivable that in one situation, an organization may view itself as a PROVIDER, in another as a USER.

It is this model that suggests development of greater institutional capabilities and more effective, distributed delivery of education/training programs. The brokering service model constitutes a major contribution of the project.

The model was accepted by the full Technical Advisory Council at its August meeting. In looking to implementation, the Council began examining ways to create this as a sole source brokering service--in other words, "one-stop-shopping" for industry. The brokering services model is predicated on open bidding and a purchasing decision made by the USER.

Chapter 5

PROJECT FINDINGS

Although the High Technology Training Consortium project has reached a very definite result with concrete, visible evidence of its accomplishments, there is a heirarchy of findings that should prove useful to Vermont and others who wish to follow in her footsteps. This section will report on that heirarchy of findings and the attendant implications, leading up to the major outcome of the project which will be reported in Chapter 6.

SKILLS AND TRAINING NEEDS ASSESSMENT

First, a list of 25 job titles that are important to Vermont industry was created. As previously reported this information came from the members of the Technical Advisory Council. The Council members submitted, along with the job titles, a list of job skills they felt were needed by each job. These were intended to identify the level and type of skills to which the job title referred. The list of 25 job titles and their attendant skills is a composite of the information received from the Council, and is presented in Appendix II.

This result was valuable for two reasons:

- It caused us to reexamine our definition and application of the term "high technology". The ensuing conclusion confirmed the original decision of the Technical Advisory Council to pursue the need for technical training in many industrial settings rather than in high technology industry only.

- It provided the foundation for the survey instrument that was to be used to sample Vermont industry's needs for skills and training in highly technical areas.

This list of 25 jobs was upgraded by adding the job descriptions obtained from the Standard Occupational Classification (SOC) Manual and the Dictionary of Occupational Titles (DOT). This list was sent to industry firms in Vermont and they responded with the addition of five more job titles (along with their attendant skills) which were not on our original list. This more comprehensive list appears in Appendix III.

Armed with this data, a subcommittee of the Technical Advisory Council grouped job titles by level of education required and eliminated duplication by combining skills. They then converted the result to a list suggesting topical areas for which training should be made available to industry (see Appendix V).

While the subcommittee was working on this information, the list of 30 job titles with their corresponding SOC or DOT numbers was being sent to the Research & Statistics section of Vermont's Department of Employment & Training with the request that they be checked against the state's data bank for projections to 1990. From their response came the listing given in Appendix IV. Picking the top ten from that list we project openings to 1990 as presented in Table 5.1.

Table 5.1

Job Category	Estimate of Total Job Openings 1983 to 1990
Clerical Occupations	4165
Customer Engineer (Sales Reps., Tech.)	1211
Electrical/Electronic Engineers	770
Engineering Technician	756
Office (Technician) Machine Operator	581
Electrical/Electronic Assemblers	448
Industrial Engineers	378
Computer Programmers	364
Telephone Operators	231
Mechanical Emgineers	217

When we review the skills needs anticipated for these top ten job demands we find a need for training in "....computers, computer applications, mini-computer operations, data entry languages, word processing skills, troubleshooting both analog and digital electronic equipment, knowledge of digital and analog circuit design, design computer memory subsystem, ...", etc. is common among many of the categories.

There were several shortcomings in the assessment techniques used. These resulted from inexperience, a limitation on sample size, and the effort to formalize data collection which is best done by listening and talking with industrial representatives. Its resultant value is a description indicative of industry's "felt need" for skills and training. This descriptive element adds a valuable dimension to the statistic-based data collected and analyzed elsewhere.

It is apparent that the need for technology-related training is present in nearly all of these jobs However, a review of the list of topics suggestive of the training that industry said they needed shows that they are asking for a great deal of training that is not considered high technology. This study attempted to reconcile these points and concluded that industry wants people trained in high technology who also have other generic skills, such as communication, interpersonal relations, and math/science preparation. Clearly, a solution was needed which could equally address the high technology and related other training needs of industry. It was at this point that the study took a wider perspective on what it was doing.

BROKERING SERVICE MODEL

From these assessments, the Technical Advisory Council identified a broader role for education/training delivery in Vermont. This developed into four major areas for future emphasis:

1. Math & Science
2. Institutional Capability
3. Distributed Delivery
4. Brokering Service

The Council responded positively to the brokering service and recognized its immediate application. Discussion soon brought out the fact that development of such a brokering service could easily identify an appropriate delivery system and also have an impact on the capabilities of the institutions involved. This being the case, the Council appointed a subcommittee to explore the Brokering Service and leave other areas for future attention. The results of this development are described in Chapter 6.

APPROPRIATE SPONSORSHIP

Concurrent with the development of the brokering concept the Office of External Programs proceeded to conduct a pilot survey of the educational resources of the state to determine the basis for sponsorship. This resulted in considerable interest on the part of our educational institutions. In response to the first survey, 26 institutions indicated capability of providing some level of education/training from high school to college level over a broad range of 24 topic areas. Appendix VI displays all the institutions queried and their responses to date and the content areas for which they indicated expertise or resources. In addition, this information indicates their resource capabilities in terms of facilities, instructors, or both.

This information is being placed in a data base management system so that, when a request for a proposal is received for instruction on any of the designated topic areas, the computer will prepare a mailing to all the institutions which have requested to participate in that particular topic area. Many institutions may elect not to bid for geographic, logistic, or other reasons but receipt of the request for proposal will enable them to keep abreast of the type of need that is being expressed by industry and to evaluate their own capabilities to respond.

Chapter 6

BROKERAGE SERVICE MODEL

The many facets of High Technology are constantly being analyzed in the media these days. Some hail it as the last, great hope for a way out of our economic doldrums. But even the strongest advocates of High Technology recognize that it is not without its problems. Where will the skilled workers be found to conceive, design, plan, implement, and interface with High Technology? What will happen to our existing workforce? How do we deal with the casualties (low-skilled workers)? The many concerns being voiced today are putting pressure on our education system to gear-up for the challenge, and on the government to come up with answers. These pressures are calling for industry, education, and government to work together to identify the problems, pinpoint the needs, design solutions, implement programs, and evaluate results. It is axiomatic to point out that where the highest degree of cooperation exists, there will be seen the most effective results.

One response to this demand for cooperative effort is a brokering service; a concept where a "broker" functions as a link between the need for education/training and the existing resource(s) capable of meeting that need.

PHILOSOPHY

A variety of needs appear to be met by a functioning brokerage service for training. It is most helpful to examine those needs from two perspectives.

Business and Industry Needs

A given business or industrial entity exists for the purpose of manufacturing and/or selling some product or service. There are many costs associated with the that task, among them: capital, raw materials, facilities, machinery, and a work force. Each of these cost factors represent an initial investment and "maintainance costs." For example, a forging machine might be purchased for $1,000,000. In addition to the initial investment, other "maintainance" costs include the interest on borrowed capital, the depreciation on the machine's present value, and the cost of maintaining the machine in working order.

Likewise, the workforce has initial and maintainance costs associated with it. In addition to the cost of wages, the employer must be concerned with the cost of keeping a worker trained with skills and knowledge adequate for maximum productivity. In this world of constantly changing technologies, that particilar cost factor is becoming more and more important.

Anecdotally, a large company in Vermont described their human resources costs in this way: "the cost of maintaining our capital is about 15% per year; the cost of maintaining our facility is about 20% per year; our machinery, about 25% per year; yet the amount we have historically spent to keep our workforce current and productive has been less than 1% per year--

and that's going to have to change." While 1% may not seem much, it represents tens of billions dollars to be spent on industrial training each year in the United States. For a given company, that's a cost of doing business which is reflected in the selling price.

Most companies, particularly those of small and medium size, have difficulty maintaining the training structure to provide those services in-house. At best, they would prefer to purchase that service in order to have better training at less cost.

Whether a company needs training for its current workforce, better preparation of its entry-level applicants, published training materials, or employees with some very specific preparation instant access to the required information is important. Businesses and industries should not have to become educational experts simply to identify or use a needed service. A brokerage service can help solve this problem.

By providing the matching of needs to resources and the clearinghouse function, the brokerage increases the effectiveness and lowers the cost of securing such resources. Industry has several requirements:

* accurate analysis of need
* rapid response
* an absenc of unfamiliar jargon
* a minimum of external requirements
* a lower cost.

Educational Institutions' Needs

With some exceptions, educational institutions, whether secondary or post-secondary, are notoriously ill-prepared to market their training resources to business and industry. For many years this has been a non-existent or minor mission. Primary concern has been the preparation of future generations of productive citizens. With the cresting of the post-war baby wave, educational institutions have found themselves with underutilized capacity. Some institutions have remained very effective in their preparation of a more technical workforce, but they, too, find a change toward a new mission of worker re-educating to be onerous and frustrating.

Colleges and vocational schools face other difficulties. With each passing year, the obsolescence of scientific and technical laboratory equipment become increasingly apparent. Funding trends indicate no relief for this concern. Related, but perhaps more severe, is the inability of institutions to attract and retain instructional staff who are up-to-date in the more technical areas.

One of the endeavors which may mitigate such problems is a broadening of these institutions' markets. By working more closely with business and industry and providing valued training services, educational institutions may well be able to borrow or have access to new equipment. Indeed, institutions may be able to purchase new equipment because of training income and improve the quality of traditional programs because of its availability. Additionally, innovative cross-placement of teachers and industrial personnel may be possible--thereby improving the technical quality of teachers.

The difficulty for many institutions is how to begin an additional new mission. Start-up costs can be exhorbitant and venture capital expensive, if available at all. While their current sources of revenue are, directly or indirectly, controlled by public policy, other potential sources of revenue remain unexploited. Among these is training services for business, industry, and public agencies. Institutions have not traditionally considered themselves as purveyors of an educational product. However, in recent years many have seen the need to become just that. At the same time, many institutions lack knowledge of the market, access to it, and the ability to present their wares in a marketable fashion. Others may have difficulty viewing themselves in such new ways.

The brokerage model provides something of "half-way house" for institutions making this move. Institutions will have access to market analysis and the information to market their particular capabilities when appropriate. Further, it creates an environment where institutions are positively reinforced for creativity and responsiveness. This can be done by a third party (broker) who can help the institution interpret industry's needs and package responses--all without putting a long-valued reputation on the line.

Educational institutions would require several characteristics in a brokering service:

- equal access to the market irrespective of affiliation
- opportunities to develop capabilities to create and provide services
- payment for services such that a new activity does not drain already meager resources.

Brokerage Service Philosophy

In order to meet these needs, the brokerage service is proposed with a multi-faceted philosophy:

- The brokerage has a service orientation. Its value is to make something easier, more effective, more efficient, or less costly. It must represent all clients equitably, irrespective of affiliation.
- The brokerage seeks institutional development through environmental change. The created environment must positively reinforce business and industry's utilization of educational institutions, and, in turn, educational institutions responsiveness to business and industry. An improved training environment can elicit change which will be much more permanant and effective.
- The brokerage must aggressively market the needs of industry to educational institutions and the capabilities of educational institutions to industry.

ELEMENTS OF THE MODEL

There are many roles a brokerage service could effectively play. Several are considered herein. Not all could be started immediately; our intent is the demonstration of on-going needs assessment and the brokering of custom training services. These would provide a foundation upon which other roles could be built.

Needs Assessment

The brokerage must act as eyes and ears for both industry and education. More important, it must be able to analyze and, subsequently, communicate what it sees and hears. Needs assessment may take several forms, some formal and some informal. However, the assessment requisite in the brokering process has several characteristics.

First, the assessment must be continuous. A yearly collection of data will elicit little more information than none at all. While it is continuous, it must also be in a variety of forms. Some information can be best gathered from structured assessment instruments by which large numbers of organizations respond. Equally valuable is the on-going, informal communication among the brokerage and its many industrial clients. This will require good interviewing and listening skills on the part of the broker. If the communication is only occasional, the accuracy of perception will be inadequate.

Second, while the gathering of information may be informal, the manner in which it is maintained and utilized must be quite formal. Many of Vermont's industries are quite small. The likelihood of a small company having a training need large enough to support a full programmatic response is relatively small. Therefore, an important role for the broker is the packaging of similar training needs from a number of companies. In order to keep the brokerage from requiring considerable staff, the data must be kept in a manner which balances automation and individuality.

Third, both the gathering and utilization of data must be done fully cognizant of its proprietary potential. In order to be successful, the broker must ensure the confidentiality of all company-specific information. While many of the specific training requirements will not necessitate proprietary information, if the brokerage is to expand into a role where it influences the kinds of "traditional" educational programs offered, an ability to make projections based on confidential, often proprietary, data is essential.

Finally, the brokerage should strive for gathering of needs data by a "call-in" electronic mail service. This would allow the collection and distribution of information in a timely, orderly, and confidential manner. It would also assist in keeping the personnel overhead of the brokerage to a minimum.

Brokering of Custom Training Services

The project has begun pilot testing of a brokering model for custom training services. Such a service has three primary functionaries. It may be of value to view the brokering model from the perspective of each of the primary participants--the BROKER, the USER, and the PROVIDER.

* The BROKER

The BROKER may be a public or private organization, government agency or consortium capable and willing to act as a neutral facilitator of training needs and their resolution. The BROKER may be directed by or act with the advice of an advisory council. The BROKER will utilize as many resources as possible in the process of assessing needs; defining education/training program specifications; seeking appropriate expertise, facilities, equipment, and materials for program implementation; administering and promoting programs, and evaluating program results. Such resources may include, but are not limited to, Chambers of Commerce, Industrial Development Commissions, Economic Development Agencies, and other organizations active in community/business affairs. The BROKER will promote the broadest possible participation of USERS and PROVIDERS.

The services of the BROKER will be available to the USER for assistance in identifying need areas; defining specific skill needs; writing RFP's; evaluating proposals; and arranging for presentations, contract negotiations, program administration, financial administration, and program evaluation. The services of the BROKER will be available to the PROVIDER for assistance in evaluating RFP's; identifying expertise, facilities, equipment, and materials; writing proposals; pricing proposals; program administration; financial administration; and program evaluation. Additionally, the BROKER will regularly poll known potential PROVIDERS for an indication of the those content areas for which they would like to receive RFP's.

The BROKER will function as monitor of the process in a manner which results in the highest degree of satisfaction to the USER and PROVIDER. It will be the responsibility of the BROKER to develop and maintain the contacts and capabilities to best serve the process. In the event the training resource needed cannot be located within the State, the BROKER will endeavor to secure the necessary resource(s) elsewhere at a price and in a form satisfactory to the USER. In such cases, the BROKER will attempt to make the presentation of the resultant program available to in-state PROVIDERS interested in acquiring the expertise.

* The USER

A USER may be a business, company, government agency, public or private organization, union, or a group of individuals. In short, a USER is any entity in need of education/training and capable of generating an enrollment sufficient to make a training program economically feasible. Under certain circumstances, an educational institution may become a USER so, for instance, its faculty can receive advanced training in some technology. Usually, a person or group of persons representing the interests of the USER will be empowered to function as the agent of the USER, and will hereinafter be referred to as the USER.

It will be the responsibility of the USER to clearly define the education/training need in specific terms. With the assistance of the BROKER, the USER will develop a Request for Proposal (RFP) in an appropriate RFP format. The USER will submit the RFP to the BROKER and will receive from the BROKER all proposals submitted in response to the RFP. The USER may schedule any consultations, investigations, or evlauations it deems necessary to arrive at a decision in selecting a proposal. If the USER desires to implment a combination of features from two or more proposals, the BROKER may be requested to negotiate such a program. The decision selecting a proposed program for implementation lies solely with the USER.

Upon selection of a proposed program for implementation, the USER will notify the BROKER and enter into contract negotiations with the BROKER and the PROVIDER. The USER may also participate in the implementation of the resulting program by providing facilities, materials, services, or expertise where appropriate. The USER will also monitor the progress of the program and evaluate the results achieved. In summary, the USER will function in concert with the BROKER and the PROVIDER throughout the process to help ensure the satisfaction of its education/training need.

- The PROVIDER

A PROVIDER may be any school, college, university, government agency, public or private organization, consultant, or consortium capable of providing an education/training resource. Industry has indicated an interest in being considered a PROVIDER under those circumstances when the resource is unavailable from the educational sector; for instance, the faculty of a college may seek advanced technical training best provided by industry.In the event that several PROVIDERS combine to present a single proposal, they will usually appoint a person or group of persons to act as agent for the consortium; the agent will be referred to as PROVIDER.

The PROVIDER will receive all RFP's for those content areas for which it has indicated available resources. The decision to respond to a specific RFP rests solely with the PROVIDER; intent to respond should be communicated to the BROKER within five days of receipt of the RFP. The PROVIDER is free to respond creatively and imaginatively to meet the needs of the desired training need. However the PROVIDER should address the RFP specifications as they are presented but may append variations, improvements, or suggestions. The proposal will usually be required within two weeks of the receipt of the RFP. The PROVIDER will be prepared to answer questions, make presentations, enter into discussions, or in any other manner explain or descirbe its proposal at the request of the USER or the BROKER.

THE BROKERING PROCESS

Depending on the nature of the training need, the brokering involved may be anywhere from a relatively quick polling of training resources to a full, detailed RFP process. While, there will be a tendency toward the former, every effort should be made to avoid the exclusion of any interested PROVIDER. A "slow-motion" look at the brokering process reveals nine steps:

1. Identifying the Need

The principal responsibility for identifying the need is the USER. Most often the need first becomes apparent within the operations of the USER. Frequently, the BROKER can be helpful in reviewing the problem area and in pinpointing specific training needs. When the occasion arises, as may frequently be the case, that the USER feels the need for training, but cannot justify a programmatic response, the BROKER may be able to assemble this need with other USERS' needs of a similar nature--creating a need large enough to warrant programmatic response. From its unique position, the BROKER may sense a need and generate an orchestrated response. In certain instances, potential PROVIDERS may be involved in this and the next step.

2. Designing the Request for Proposal(RFP)

Together, the USER and the BROKER generate the specifications which become the basis for a Request for Proposal (RFP). (When necessary, assistance can be obtained from one or more PROVIDERS in arriving at appropriate specifications.) In its final form, the RFP is approved by the USER.

3. Producing and Distributing the RFP

Once approved, the RFP is produced in quantity and distributed by the BROKER to all interested PROVIDERS. Proposals are requested within a two week period.

4. Designing the Proposal

"The proposal is no better than the RFP." However, within the parameters of the RFP, the PROVIDERS can design a multitude of approaches. Here is where the ingenuity and expertise of the various PROVIDERS comes into play. For those needing assistance, the BROKER can function as a consultant in the preparation of proposals.

5. Producing and Submitting a Proposal

Within two weeks of the receipt of an RFP, the PROVIDER submits to the BROKER a detailed proposal for the delivery of the desired training. In its final form, the proposal is the product and responsibility of the PROVIDER.

6. Reviewing the Proposal

The BROKER will collect the proposals submitted by the deadline and deliver them to the USER. At this point, the USER takes the responsibility of reviewing the proposals; consulting with the BROKER; seeking advice from other USERS; or asking for formal presentations by one or more of the PROVIDERS. The BROKER will act as a catalyst in this process.

7. Selecting a Proposal

After appropriate consideration, the USER is expected to select one of the proposals for implementation. This will constitute intent to enter into a contract with the PROVIDER for the delivery of training.

8. Contracting for Training

Since the proposal represents an offer and the selection represents acceptance, negotiation of a contract should generally be brief. However, there may be those occasions when a USER desires to put together the elements of several proposals and may wish to negotiate a new package. The BROKER may be asked to function as a program administrator and fiscal agent. In general, contract negotiations should not be time consuming. The implementation of the program will then follow in accordance with the contract.

9. Evaluation of Performance

It is important for the success of this process that all aspects be evaluated by the participants and appropriate adjustments be made to make the process flow smoothly toward the desired outcomes. Each participant--the USER, BROKER, and PROVIDER-- will complete an evaluation. The BROKER will be responsible for collecting and processing the evaluations. Appropriate feedback will be sent to each participant. Results will also be summerized for the appropriate advisory council.

Among the chief strengths of such a process is the customized nature of the resultant education/training programs. The USER need not thumb through catalogs seeking just the right course; here the course is adapted or designed by the PROVIDER so as to meet the exact requirements of the USER. On the other hand, the opportunity is available for the PROVIDER to present alternatives, improvements, and imaginative approaches to achieve cost effective training.

In addition, the USER need not consume a great deal of time and effort seeking out a resource capable of deliverying the program needed. The BROKER maintains continuous contact with many resources capable of service in a variety of content areas. The two week response period is both desirable and realistic. By the same token, the PROVIDER need not consume time, effort, and resources in finding a USER for its services. Such a service is provided by the BROKER in an effective, timely manner.

One of the by-products of such a service will be the potential upgrading of resources available in Vermont. Occasionally, no acceptable proposal arrives from Vermont PROVIDERS. In this instance, the BROKER will rely on reciprocal agreements with similar services in neighboring states or secure the resources from out-of-state. Every effort will be made to provide an opportunity for the participation in these types of training activities by in-state PROVIDERS interested in developing their capabilities.

The Brokering Service can provide rapid, appropriate response to training/education needs in business, industry, and public agencies. Concomitantly, the many valuable training and education resources of the State will have equal opportunity to be responsive.

Brokering of Training Materials

There is an abundance of vocational and technical training material developed and produced each year. For both the educational institution trying to keep programs current and the industry with a training need, there is a tendency to reinvent programs or modules as the need arises. An important role for the brokerage service would be as a clearinghouse for information on specific or general training materials available.

The brokerage should make this information generally available by means of an electronic mail service or, at the very least, by subscribing to such a service on behalf of industrial and educational clients. This represents a need which, though frequently articulated, has not been adequately researched.

Brokering of Placement Services

Colleges and universities frequently offer a placement service to their graduates. Such services can be valuable, particularly to the newly graduated student. However, many of industry's needs for specialized employees require skills usually not attained without several years of industrial experience. Also, many small industries are not fully aware of where to go for assistance in finding college graduates in particular disciplines. These represent instances when a brokerage service might assist both the college placement service and the industry by bringing the two together or [illegible]ding a clearinghouse for information.

Again, an electronic mail service may allow placement resources and industrial needs to be merged in one place at one time.

Faculty Lend-Lease

We hear a lot these days about vocational and technical educators with no recent industrial experience. We also hear a lot about industry being willing to lend out engineers and technicians as educational resources. Unfortunately, the spirit may be willing but there seems to be no mechanism for getting the two together.

Again, the brokering service model may be of considerable value. If the brokerage is already working closely with both industry and the educational institutions, much of the mechanism would be already in place.

An adaptation of this service might be designed for laboratory equipment. Frequently, industry has equipment which has been fully depreciated and is looking for someone to make use of it. Again, no way for the need to meet the resource except by blind luck.

ROLE OF THE TECHNICAL ADVISORY COUNCIL

As a brokering service model moves into a demonstration mode, the Technical Advisory Council's role becomes increasingly important. The current composition of the Council is ideal to oversee a process which must converse effectively with both industry and education. Continual review of procedure and involvement in evaluating results will keep the service from straying too far afield from timely needs.

However, the Technical Advisory Council should not exert significant effort in an overseer capacity. Its greatest continued value is the creative and resourceful generation of new ideas. It is in this capacity the mixture of industrial, educational, and other perspectives sows the most fertile seeds. This mode of operation is to be nurtured and developed.

USE OF TECHNOLOGY

In Vermont, we have barely scratched the surface of using high technology for the delivery of services, educational or otherwise. We tend to think of a "forced self-reliance" and a reverence for traditional ways. Yet, the geographic and demographic characteristics of Vermont dictate against successful delivery of our resident services in any traditional mode. It is significant that Vermont lies within a short distance of the technical education centers of the Northeast. Technology-based mediums offer a way to expand our available resources and overcome some of the barriers which beset us.

Yet, technology-based educational delivery systems have their own special needs and requirements. A critical mass of participants may be defined in much broader geographic terms, but it is nonetheless important to the economic viability of any training offering. The brokerage service provides a means to locate and organize participants for virtually any kind of training delivery. However, it particularly lends itself to organizing and staging technology-based events.

The delivery mediums which could be developed and sponsored by the brokerage include:

* Sub-carrier Radio Transmissions

We have begun to explore the potential for one- and, possibly, two-way FM transmissions utilizing the sub-carrier waves of commercial or public radio stations. For instance, Vermont Public Radio has two transmitters in Vermont by which its signal reaches nearly 90% of the state's population.

* Interactive Television

Several of Vermont medical care facilities have created an interactive (two-way) television system. The Interact Network is headquartered at Dartmouth College in Hanover, New Hampshire. The system allows picture and voice transmission from the studio(s) to remote sites and voice transmission back. The potential for use of this system for training in areas besides health care has not been adequately explored or exploited.

* Video Cassettes

The common availability of videocassette recorders and players gives this medium an instant acceptance factor that may outweigh some of its didactic shortcomings. The brokerage could contribute in two ways: obtaining tapes produced elsewhere for meeting specific needs in Vermont and assist in the production of taped versions of some of its brokered training activities.

* Micro-computer Assisted Instruction

While this is a medium which is currently more restricted by its software than its hardware, one should not expect such a limitation to continue. As the microcomputer market settles on several common operating systems and microcomputers become a standard classroom tool in this nation's research universities, the "courseware" to assist with instruction will be increasingly available and sophisticated. This raises interesting prospects for further diluting the requirement for "critical mass."

* Computer-directed Laser Disk

This medium combines the interactive virtues of computer assisted instruction with the learning intensity of television. Video presentations of an incredible number of alternatives can be instantly accessed in this medium. As with computer assisted instruction, the hardware capabilities currently exceed courseware.

* Electronic Networking

We are seeing a revolution in the way in which information is transmitted. Business and industry are not only acquainted with the advantages of data networking; they demand its instant access from other information sources as well. As the brokerage develops a base of information services, it will be necessary for that information to be available through such electronic means.

- Satellite Transmission

  What satellite television transmission has done for conferencing, it beckons to do for industrial training. It is in this medium that training of a proprietary nature can be done among broadly distributed company locations. The medium also provides for the delivery of more generic training. At this time, cost is prohibitive for a small state like Vermont, but current projections suggest that will not continue for long.

MEETING VERMONT'S TRAINING NEEDS

A brokerage service such as the one described earlier could have a significant impact on Vermont's training and education capabilities. The service could help improve services for both current and future labor forces.

General Educational Preparation

The preparation of our citizenry by primary, secondary, and post-secondary educational institutions has received a great deal of attention in recent months. While it would be pretentious to think a brokering service could contribute the broad needs of our educational system, we do believe some contributions could be made.

As our industrial sector moves from a skill-based to a knowledge- or concept-based workforce, the conceptual abilities of our high school and college graduates must also move. This is made more critical by the hypothesis that the average American worker will change jobs more than ten times in his/her life. These factors will require an educational system which promotes flexability, adaptability, creativity, and conceptual thinking.

Additionally, as technical knowledge becomes a more common thread in our labor fabric, math and science "literacy" become increasingly critical.

By promoting a constant and comfortable forum for discussion and problem solving among the industrial, business, and educational sectors, the consortium and its brokering service can improve the understanding and appreciation of each sector's needs, capabilities, and responsibilities. Curricular decisions will be made with more awareness of "real world" requirements, and industry may take some ownership of the education system's results.

This sort of impact will cross all educational levels; only the specificity of needs will increase with educational level. It is a contribution the consortium has already begun making at the post-secondary level. Its impact could be broadened considerably.

Upgrading the Current Workforce

Because of the rapid increase in the technological component of most industrial jobs, Vermont, and other states, is faced with an existing workforce which lacks much of the knowledge required for improved productivity. Specifically, significant portions of our workforce are without adequate math, science, and computer knowledge and skills. The consortium has given considerable attention to this area.

Specifically, the brokerage service could assist in getting the instructional resources together with people already employed. Additionally, by working with the secondary vocatioral system, the higher education community, the Vermont Student Assistance Corporation, and those state agencies concerned with skills for the unemployed; the brokerage could help to ensure equitable distribution and availability of programs to provide these "new basic skills" to persons displaced by economic conditions or technological change.

Providing Entry-level Training

Preparing individuals for productive entry into the job market is an explicit charge to the secondary vocational system in Vermont. The same charge, though more implicit in its statement, exists for the rest of secondary and higher education. However, our institutions' understanding of what constitutes "entry-level" is, in most cases, less than adequate. Before curricula can be upgraded and updated, it is essential that those making educational policy at the state and local level have access to and an appreciation for accurate and informative descriptions of the current and projected skills and knowledge needed for entry into many employment areas.

Again, the brokerage could serve as a clearinghouse for gathering and distributing this kind of information. It could assist with the continuing effort to develop a comprehensive approach to vocational, technical, and professional education.

Continued Preparation of Professionals

An educational need which is becoming more and more apparent in Vermont is the continuing education of our technical professionals and the technical orientation and training of otherwise non-technical professionals. Whether a group of physicians needs training in the use of microcomputers for patient research or a local or state society of mechanical engineers seeks training about microprocessor controlled devices, the full educational resource of the state is seldom tapped. This represents a need of increasing proportion; the rate at which new knowledge must be assimilated by the professional is increasing dramatically. It is another area which lends itself to the brokering function.

PUBLIC RELATIONS

The expertise required of a successful brokerage is cumulative in nature. That is, the more brokering work such a service successfully provides, the more expert it becomes in how to provide the services, and, consequently, the more brokering work it is asked to do.

It would be foolhardy to rely on word-of-mouth to either establish such a service or increase its performance level. Even a state as small as Vermont, where informal communication can be very effective, would not respond to the existence of this service without active promotion. It will be necessary to present the service in a professional manner: printed brochures and fact books, descriptive materials for the variety of services which are provided, and frequent visits with the state's industries and educational organizations. Both sides of the brokering equation must be courted and convinced to allow someone else to do their legwork.

This is an area for which the Technical Advisory Council can act as a testing ground for promotional approaches. The mix on the Council approximates the types of constituencies to which the service must be sold.

Successful presentation of this service may have the residual effect of informing the educated Vermonter that there are excellent employment and training opportunities in the state. This may help curb the export of our highly educated and trained youth--a problem this state has faced in the past.

ECONOMIC DEVELOPMENT

Availablity of an adequatlely trained workforce and the quality and availability of educational/training resources are important factors in a high technology company's decisions for plant location or expansion. Accordingly, a quality training brokerage service should have a positive impact on industrial development efforts in Vermont.

New Industrial Location

When an industry is contemplating the location of a new plant, one of many determinants is the availablility of a trained and/or easily trainable workforce. Vermont has made significant gains in developing and conducting training of potential workers for specific industries. Much of this work has been done by the state's Agency of Development and Community Affairs. The same sort of need has been expressed at the local and regional level. In either case, ease of access to educational and training resources is critically important to the marketing of Vermont to industrialists.

Plant Expansions

As important as the development of industries new to the state is an environment which promotes the expansion of industries already operating in Vermont. It is generally agreed that industrial "migration" is not the primary source of increased levels of employment; rather, the expansion of small and existing businesses accounts for the most significant growth. For example, in Vermont in 1981, three times as many new jobs were generated by company expansions as by companies new to the state.

The availability of training and its effect on worker productivity can be a significant factor in the success of companies operating in Vermont. The success may result in employment increases at a rate much higher than new industrial development. It is to this type of "less formal" economic development that a brokerage service may be of great value.

Chapter 7

PROJECT OUTCOMES

Aside from those tasks and activities for which the project was contracted, there have been many important outcomes resulting from our activities. While some of these are less tangible in nature, they probably represent the really significant impact of the consortium and its activities.

CONSTRUCTIVE COMMUNICATION

As we discussed in Chapter 4, the Technical Advisory Coucnil represents a first-of-its-kind, statewide forum for the discussion of technical training issues among industry, education, and government. In addition to its membership, the forum has been extended to anyone wishing to participate. Over the twelve months of the project, the "gallery" at Council meetings has included representatives from local development groups, chambers of commerce, private training contractors, educators, state agencies, the state legislature, and the media. We have welcomed their participation beyond just passive attendence.

The importance of this forum has been attested to by its membership and others familiar with its work. It may seem overly dramatic to keep reenforcing the importance of just plain conversation among educators, government officials, and industrial representatives. But, in Vermont and, we suspect, other states, this type of conversation has failed to occur with enough frequency to begin the "dropping of defenses." The significance of the Council's growth and development over a one year period is the constructive, critical, and honest nature of important discussions. It is this open forum we hope to continue.

IMPACT ON RELATED EFFORTS

The project has had some impact beyond its own boundries. Often, this impact only takes the form of recognition of the project's existance. However, there is some impact implied in such recognition. At other times, participation of the project has been actively sought to assist in other related activities. For example:

- A Vermont Special Cabinet for Employment and Training was created by executive order in 1981. During the past year, our project's staff has reported to the Cabinet on the Council's meetings and the project's activities. Indeed, two of the Cabinet's five member agencies are representerd on our Technical Advisory Council. Recently, the Cabinet published the Employment and Training Five-year Plan. In the one-year, operational section of the plan, the Cabinet proposes to "hold joint meetings with other groups involved in the general area of employment and training...such groups include...the Vermont State Colleges' High Tech Council. This activity is in response to an objective to "improve the coordination among existing Employment and Training programs across the state."

- In April, the Education Commission of the States, University of Vermont, and several professional teaching associations co-sponsored a conference on "Mathematics and Science Education in Vermont's Public Schools." Many recommendations resulted in areas which are directly related to the work of the consortium, including: capacity building, standards, teacher preparation, and quality of laboratory equipment. And under the heading of "leadership," the conference recommended "As one means of promoting better liaison efforts between business and education, it is emphatically suggested that the High Technology Council be continued and that state government officials continue the initial efforts to focus time and resources on this critical area of education."

- Norwich University, the Central Vermont Economic Development Corporation, and the Small Business Administration invited the High Technology Consortium to co-sponsor a High Technology Conference, which was held August 11, 1983 at the campus of Norwich University in Northfield, Vermont. Project staff participated in the planning and staging of this first annual conference which attracted nearly 80 participants. Nearly all of the Technical Advisory Council attended the conference as it concurrently held its August meeting.

TRAINING PROGRAMS

There have been several training programs undertaken which have involved members of the Technical Advisory Council. It would be inappropirate to suggest a direct role in some of them, but frequently the forum of the Technical Advisory Council for discussions of technical training problems resulted in resources getting together with the need--the brokering process in its most basic form. For example, the chief executive officer of a small engineering services firm expressed a significant need for training in Computer-Aided Design (CAD). The open discussion of this need, as representative of others in high technology, resulted in a response by a college and a state agency.

In other instances, the project's work has resulted in the initial demonstration of the brokering model. As this project ends, requests for proposals were being prepared for two industrial clients. Each understood the demonstration nature of our response and the associated constraints; however, each saw the value of the model in terms of meeting their training needs and contributing to the outcomes of the project.

ADOPTION OF THE BROKERING SERVICE MODEL

As we have described in Chapter 6, the project developed a model of a brokering service which could be demonstrated and implemented in Vermont. There has been overwhelming support for this service from both the Technical Advisory Council and from the educational providers of the state. The Council's insistance at continuing and working toward the goal of implementing this model is testimony to the importance of the project and its work.

Chapter 8

CONCLUSIONS AND RECOMMENDATIONS

Among those people and organizations who have come in contact with this project, there seems to be nearly unanimous agreement on its value, its importance, and its potential. The very existence of the Technical Advisory Council has made an important impact on the training delivery system in Vermont. Moreover, its work and the associated staff work has elevated that impact to the level of significant contribution. Yet we have only managed to scratch the surface in the resolution of Vermont's many technically-related education and training problems.

CONCLUSIONS

We have reach conclusions in three major areas of this project. They are discussed in earlier chapters, but warrant summarizing here. Some were easily and joyfully reached; others were elusive; and others, yet, were painful.

Technical Advisory Council

It is without hesitation that we conclude the establishment of the Technical Advisory Council must be considered the single most important undertaking of this project. Near the project's ending date, our project officer visited and spent several hours with members of the Council. His comments were most succinct: "I am impressed with the insights, concerns, and perspectives of the members of the Technical Advisory Council with whom we met. They are obviously a dedicated and hard-working group of people."

The Council represents a group of 19 individuals, most of whom had never met one another. Yet, most represent powerful constituents who have a lot to gain or lose by their presence and participation. In the ten months of their acquantaince, we have observed a rapid and steady movement in the direction of leaving "turf issues" behind, seeking new and innovative approaches to the resolution of our technical training problems, and development of a very real, sincere camaraderie. This Council represents a constituency broad and powerful enough to have a political impact should it be called for.

However, an advisory council such as this can not operate in a vacuum. While they have expressed satisfaction with "getting together every couple of months" they have also demonstrated an impatience with the pace of the process. These are professionals taking valuable time away from important jobs. They are used to decisive action in their workplace; they expect the same from the public sector. They want to have an impact; they want to move and move quickly. Council members have indicated that if there is no movement toward demonstration of the fruits of their labor within six months it will have been another government-funded exercise in futility.

One member of the council summarized it very well: "you've gotten what you've paid for; you've not gotten what you deserve" The potential for demonstration and eventual implementation is massive. The Council recognizes this, acknowledges their own contributions and responsibility. To this end, the Technical Advisory Council has elected to continue whether demonstration funding can be found or not. They are determined to succeed and make a difference in this state. As a result, they are scheduled to meet in October, 1983 to plan for the near future.

Assessments

The area where we have felt the least success is in the Skills Needs and Training Needs assessments. There are a variety of reasons for this dissatisfaction with our results. First of all, we concentrated on the collection of information using written instruments. We felt the need to do this for reasons of time and in an attempt at objectivity. However, we found we got our best understanding of these needs when the vice president of a small, high technology company called us up and asked if we could spend a couple hours with him. In that time, he explained his inability to communicate his needs in written form generally, and in response to our instrument, specifically. We then spent the next two hours listening, questioning and beginning to understand the nature of this company's needs. In retrospect, less emphasis on objectivity, and greater reliance on listening and subjective analysis will result in much greater communication of need and a better understanding of the various perspectives.

Because of the developmental orientation of this project, we guaranteed and observed strict confidentiality through anonymity of assessment response. While this was not a great liability in the pursuit of the project's objectives, it would result in gross ineffectiveness if continued in the future. Confidentiality will need to be guaranteed and demonstrated in a manner which, over time, convinces business and industrial clients that they can trust us with potentially proprietary information about training needs. This level of trust cannot be "given," only earned.

When combined with the duration of the project, the limitations of the contract with respect to "numbers of respondents" placed severe limitations on the effectiveness of assessment. As a lone factor, this limitation might may have caused us to seek subjective information on an individual basis. As indicated above, that might well have been more effective. But, with other requirements and constraints, it was not practical.

However, the relative ineffectiveness of the assessment mechanism had some positive results as well. The limited value of our assessment results led us to what we consider a valid hypothesis: any long term improvement in the effectiveness of Vermont's training capability will result the development of an environment which reinforces training innovation and delivery. Designation of programs for development and delivery will have a short term benefit, at best. It is this perspective that motivated the Council and project staff to develop the brokering service model and the other "areas for future emphasis.

Also, the assessment efforts did result in information which adds a descriptive element which is absent from many of the labor market projections done in Vermont and elsewhere. Traditionally, these statistical studies have depended on such resources as the Dictionary of Occupational Titles for descriptions of associated skills and educational preparation. We found that despite the reverence often given these resources, their skills description value was severly limited and, frequently, obsolete. In that regard, we have some valuable information which, though without much statistical validity or reliablity, does provide some insight into training needs.

The Brokering Service Model

We are cognizant that we have not just newly discovered the concept of "brokering", yet we hope we have seen its potential it holds for creating and maintaining an environment which helps develop institutional capability while delivering training services at a new level of efficiency and effectiveness.

We recognize the need to lay a foundation by first brokering definable training programs. However, we also see the potential for acting as source of information and match-making in a wide variety of areas. Some of these were discussed in Chapter 6.

While the articulation of this model occured late in the project period, it has had a significant effect on potential providers of training and on potential users. In fact, one outgrowth may well be a similar service offered on a local level by local and regional technical training consortiums. We encourage this development. It not only represents cooperation and coordination of training resources at a key level, it also alleviates the need for any forthcoming state-wide brokering service to meet all needs, everywhere. At the same time, there will always be a certain portion of local needs which can't be satisfied with local resources. In these cases, the local broker would have someone with a broader set of resources for which to provide services. We will continue to encourage and support such developments.

In effect, this entire project has been a brokering activity. As with any brokering function, there is an element of developing expertise, opening lines of communication, matching needs with resources. It is from these conceptual beginnings we hope to develop a valuable set of tangible services.

The "Intangibles"

These are and will continue to be important aspects of this project. The increased levels of communications within, as well as outside, the Technical Advisory Council are very gratifying. As we have noted, ours has been an effort to open up systems, make them accessible to one another, and stimulate communication among them. From this, we are reinforced in our conviction that improved communication never has a detrimental effect. It is this result of the project which we hope and plan to continue.

We are constantly befuddled by one observation. There seems no end to the demand for technical training services, yet resources go undeveloped and unused. There is a process problem. We don't need more schools and colleges, but we need to stimulate their responsiveness, their ingenuity, and their utilzation by others. It is this conclusion which spurs us on.

THE FUTURE

This project will continue. Efforts to maximize its pace, support, and effectiveness will also continue. The committment represented in the activites described earlier will sustain our efforts for a short time. A seed has been planted, nurtured, and now looks for protection from the elements. It is our determination to see that it grows.

It is necessary to establish the brokering service model through demonstration and, eventually, full implementation. The first step of this is possible now and will be carried out. Resources will be put together with training needs. Whether this becomes a foundation for other actitivies or and end unto itself is less germane to this report than the assurance that a minimal amount of activity will continue.

What can be built on that foundation is a great and deserving challenge. As a small state, Vermont is incredibly self-reliant. And yet, ease of access and utilization of our resources is sometimes difficult. Our efforts will be to improve the ease with which resources are made available. The emerging technologies which can enhance the delivery of training resources presently go unexamined and unexploited. Yet, they may represent a major contributor to the improvement of our human resource development capabilities. Access to all of Vermont's resources, as well as national and international resources, could be made possible through these technologies. They deserve investigation.

We consider this project an overwhelming success. Its potential for continued contribution is apparent and stimulating. We are grateful for the support it has been given to date. "You've gotten what you paid for ..."

APPENDICES

Appendix	I	Technical Advisory Council membership
Appendix	II	Skills List by Job Title
Appendix	III	Occupation important to High Technology Industry (with associated skills)
Appendix	IV	Estimated Opening 1983 to 1990 by job title
Appendix	V	Suggested Training Courses
Appendix	VI	Designation of Content Areas for RFP's

APPENDIX I

TECHNICAL ADVISORY COUNCIL

HIGH TECHNOLOGY TRAINING CONSORTIUM

VERMONT STATE COLLEGES
OFFICE OF EXTERNAL PROGRAMS
MONTPELIER, VERMONT

MR. NED AUSTIN TEL. 878-8855
TRIAD DESIGN SERVICES, INC. 878-4077
P. O. BOX 36
ESSEX JUNCTION, VT. 05452

CHAIRMAN AND CEO

Mr. Austin has overall responsibility for the company but concentrates operationally on long range planning and administration.

Triad is a full service engineering documentation firm which has an immediate and long term need for high technology skills. Having experienced difficulty in obtaining these skills, the company now provides "in-house" training. They seek quality alternatives to "in-house" training.

MS. PIERRETTE BERGLUND TEL. 479-1021
BOMBARDIER CORPORATOIN Ext. 102
MASS TRANSIT DIVISION
P. O. BOX 768
BARRE, VT 05641

PUBLIC AND LABOR RELATIONS EXECUTIVE

Ms. Berglund represents the interests of Bombardier Corporation in finding employees who have higher technical skills prior to hiring.

MR. LESLIE COLLINS TEL. 877-2911
SIMMONDS PRECISION Ext. 332
PANTON ROAD
VERGENNES, VT 05491

SENIOR MANUFACTURING ENGINEER

Mr. Collins deals with the manufacturing aspects of group technology and the use of CAD/CAM equipment in the manufacturing process. He also works with robotic applications through work cell/center design. His reponsibilities include shop floor control, shop methodology and machine shop operations.

Mr. Collins is a member of the Addision County Vocational Center Advisory Council Machine Trade Branch.

MR. RICHARD J. COLLINS TEL. 223-2550
VERMONT ADVISORY COUNCIL FOR
VOCATIONAL-TECHNICAL EDUCATION
P. O. BOX 1088
MONTPELIER, VT 05602

EXECUTIVE DIRECTOR

Mr. Collins serves as the agent of the Council as directed by the Executive Committee. He acts as the professional and technical consultant to the Council and gives direction in implementing Council responsibilities of consulting, advising, and evaluation.

The Council has worked several years to encourage greater adult/post-secondary programming. Currently, the Council is concerned with identifying the training needs for new and emerging technologies, and how that training can best be provided.

MR. FRED A. COUSE TEL. 769-3627
IBM CORPORATION
PERSONNEL MANAGER 400/965-3
ESSEX JUNCTION, VT 05452

PERSONNEL MANAGER FOR IBM BURLINGTON

Mr. Couse is responsible for recruiting, employment, education, training, management development, personnel programs and services, employee relations, and medical services. In past assignments, he has been the Senior Manager for Education and Training at other IBM plants. In all of these activities, Mr. Couse has found that effective educational support systems in the technology field are important.

MR. LOUIS R. DWORSHAK* TEL. 828-3221
INTERNATIONAL BUSINESS AND
INDUSTRIAL TRAINING
DEPARTMENT OF ECONOMIC DEVELOPMENT
PAVILION OFFICE BUILDING
MONTPELIER, VT 05602

DIRECTOR

Mr. Dworshak directs the Vermont Training Program (VTP) as authorized under State statute and funded annually by the legislature.

VTP is the central program for "packaging" and coordinating the training and education resources for industry--either existing or new. For the department, the "package" is one of the most potent marketing tools for attracting industry to Vermont.

Resources for training are drawn from vocational centers and higher education while screening and hiring is coordinated through local Vermont Job Services offices (where appropriate CETA funds are obtained as well). At times, training is also related to apprenticeships.

High technology has been a focal point for VTP for several years. The training and education package will be a key in attracting new high technology firms.

MR. RAYMOND A. DUBE TEL. 773-9121
GENERAL ELECTRIC COMPANY Ext. 324
210 COLUMBIAN AVENUE
RUTLAND, VT 05701

MANAGER - MANUFACTURING, PLANT & TOOL ENGINEERING

Mr. Dube is responsible for the manufacturability of product designs, and the availability of equipment, processes and utilities to ensure meeting production schedules, quality and costs. He is also responsible for the maintenance of buildings, grounds, and equipment along with all their associated safety programs and the integration of tool and fixture designs with these facilities.

Mr. Dube is a graduate of the GE Apprentice Program and earned his Bachelor's Degree in Mechanical Engineering. He has served:

Two years on the Advisory Committee for VICA Machine Trades at the Rutland Vocational-Technical Center.

Two years as administrator of the GE Machinist/Toolmaker Apprentice Program.

Five years in active support of GE efforts to bring higher education to Rutland.

HONORABLE MILTON A. EATON* TEL. 828-3211
AGENCY OF DEVELOPMENT & COMMUNITY AFFAIRS
STATE OF VERMONT
MONTPELIER, VT 05602

SECRETARY

Mr. Eaton has overall responsibility for the operation of two departments:

Economic Development
Housing and Community Affairs

and four divisions:

Administration
Historic Preservation
Vermont Travel Division
Vermont Life Magazine

Mr. Eaton brings to the Council a wealth of experience in both the education and business worlds. His interest is in making available in Vermont the necessary education and training that will facilitate a healthy economic, business, and social climate in the State.

MR. PETER EMMONS TEL. 748-8106
EHV-WEIDMANN INDUSTRIES, INC.
ST. JOHNSBURY, VT 05819

PERSONNEL MANAGER

Mr. Emmons is responsible for the personnel function in a 230 employee non-union manufacturing operation. This includes the acquisition, retention and training of employees, as well as plant security and safety activities.

Mr. Emmons and EHV-Weidmann Industries are involved in the advisory and planning stages of primary, secondary, post-secondary and college training and education programs in the St. Johnsbury area as a means of assuring adequate educational opportunities for their employees.

MR. JEROME A. ERICKSON TEL. 674-6772
VERMONT PUBLIC RADIO
P. O. BOX 89.5
WINDSOR, VT 05089

DIRECTOR OF ENGINEERING

Mr. Erickson is director of all engineering activities at Vermont Public Radio in Windsor. This includes the training of personnel used to run the broadcast equipment, maintenance of equipment and planning of new facilities.

He taught physics at Hartford High School and Chester High School and is a member of the Hartford Vocational Center Advisory Committee in the electronics area. His special interest is in all forms of communications.

MR. KENNETH C. FORSETH TEL. 295-5800
NEW ENGLAND DIGITAL CORPORATION
P. O. BOX 546
WHITE RIVER JUNCTION, VT 05001

DIRECTOR OF PRODUCTION

New England Digital is a small firm engaged in the design, development, and manufacture of digital computers and digital sound synthesizers. Mr. Forseth is responsible for a group of assemblers and their support personnel, technicians, and test engineers. He also provides liaison with the Marketing Department and the Research and Development Department, and participates in product design and development.

Mr. Forseth is strongly interested in the quality and breadth of knowledge possessed by employment applicants, and serves as a member of the Advisory Committee for the Hartford Area Vocational-Technical School.

MR. MAURICE L. FORTIER TEL. 479-2326
15 GABLE PLACE 479-2327
P. O. BOX 692
BARRE, VT 05641

VICE PRESIDENT, VERMONT STATE LABOR COUNCIL
BUSINESS MANAGER/FINANCIAL SECRETARY, LOCAL 2326
INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS

Mr. Fortier represents the employees of the New England Telephone Company, the Continental Telephone Company of Vermont, Inc., and the Vermont Television Corporation. This entails the negotiations of all contracts and handling of all grievances. He is the union-appointed arbitrator on a Tri-Part Board in arbitration cases involving New England Telephone.

As a representative of employees presently involved with high technology and an expectation of even greater involvement in the future, Mr. Fortier has strong interest in the availability of educational opportunities for employees to train, re-train, and up-grade their skills.

DR. GERALD P. FRANCIS TEL. 656-3390
DIVISION OF ENGINEERING, MATHEMATICS
AND BUSINESS ADMINISTRATION
UNIVERSITY OF VERMONT
123 VOTEY BUILDING
BURLINGTON, VT 05405

DEAN, DIVISIONOF ENGINEERING, MATHEMATICS AND BUSINESS ADMINISTRATION

Dr. Francis is responsible for all the administrative activities within the Division, as well as the academic quality of the Divisional activities. Since this includes high technology in such areas as Business Administration, Civil Engineering, Computer Science, Electrical Engineering, Materials Science, Mathematics, Mechanical Engineering, and Statistics, both Dr. Francis and the University are interested in finding ways to better meet Vermont's high technology training needs.

MR. VINCENT P. GABRIELLI TEL. 863-1611
DIGITAL EQUIPMENT CORPORATION Ext. 471
115 KIMBALL AVENUE
SOUTH BURLINGTON, VT 0540L

PLANT OPERATIONS MANAGER

Mr. Gabrielli is responsible for the manufacture of mid-range computer systems and high-end power systems. He directs the activities of production, manufacturing engineering, plant and facilities engineering, and manufacturing service. The high technology content of these operations leads to a deep interest in using his experience and knowledge in achieving appropriate educational and training experiences to meet Vermont's high technology needs.

SENATOR EDGAR MAY
STATE HOUSE
MONTPELIER, VT 05602

SENATOR

Mr. May was a member of the Vermont House of Representatives from 1974 to 1982 where he sponsored legislation to expand the State's training capacity and help bring training programs to the Springfield area. Now, as Senator, he continues his interest in meeting Vermont's needs in the education and training areas.

MR. CHARLES A. NYSTROM TEL. 254-4688
NYSTROM TECHNOLOGY CORPORATION
47 ELM STREET
BRATTLEBORO, VT 05301

PRESIDENT

As owner and President, Mr. Nystrom outlines the Corporation's technological objectives and provides the organization-the ways, and the means to achieve them profitably in a competitive market.

Mr. Nystrom is a graduate of GE's Machinist Apprentice program and holds a Mechanical Engineering Degree from the University of Bridgeport, Connecticut. Thus, he is keenly aware of the need for skills in basic engineering concepts, machining technology, and mathematics up through trigonometry. He has worked since 1976 with the Brattleboro Vocational Department and various other departments in Vermont to promote training programs including apprenticeships.

DR. ROGER H. PERRY TEL. 658-0800
CHAMPLAIN COLLEGE Ext. 312
P. O. BOX 670
BURLINGTON, VT 05402

DEAN OF ACADEMIC AFFAIRS

Dr. Perry is responsible for the faculty and academic programs at Champlain College. The College has 22 different programs including data processing, word processing/information processing, accounting/data processing, business management, marketing management and office management. Currently, Dr. Perry is reviewing each program's curriculum in light of the developing task demands of related jobs. He is also reviewing faculty evaluation and promotion criteria, and is involved in developing a long range plan including additional programs.

Dr. Perry has recently moved to Vermont from St. Louis, Missouri, where, as Associate Superintendent, he initiated 320 joint industry-education programs. These initiatives included such programs as chemistry, computer programming, architectural drawing, actuarial science, and word processing. He is presently interested in insuring that Vermont's institutions of higher education are providing technical training programs consistent with the needs of the State's high technology employers.

DR. GEORGE M. STROUT
VERMONT TECHNICAL COLLEGE
RANDOLPH CENTER, VT 05061

TEL. 728-3391
Ext. 85

ACADEMIC DEAN

Dr. Strout is responsible for the quality and structure of the academic program. This includes the selection and evaluation of faculty, the continual review of academic courses and the academic accreditation of the school.

The literature today in education, economics, and industry all forsee high technology as of prime importance in our future society. VTC intends to stay abreast of these developments.

WALTER L. WIMMER
DIVISION OF ADULT & VOCATIONAL-
TECHNICAL EDUCATION
DEPARTMENT OF EDUCATION
120 STATE STREET
MONTPELIER, VT 05602

TEL. 828-3101

CHIEF, PROGRAM DEVELOPMENT AND STANDARDS

Mr. Wimmer is responsible for providing liaison with the private sector so that secondary and adult vocational-technical programs are responsive. Curriculum improvement is a primary function of his job, along with articulation with the Economic Development Department and the Vermont State Colleges' System.

Mr. Wimmer feels a personal and professional commitment to make vocational-technical education more relevant and responsive to private sector needs, as well as student needs. He believes programs in area vocational centers need to become more technically oriented for adults and secondary students.

His background includes ten years of manufacturing and quality control in the aero-space industry, primarily with Pratt and Whitney Aircraft.

MR. DAVID H. YOUDEN TEL. 674-2161
CONE-BLANCHARD MACHINE COMPANY
P. O. BOX 27
WINDSOR, VT 05089

DIRECTOR OF ENGINEERING

Mr. Youden is responsible for all product engineering, all research and development, and for quality assurance at Cone-Blanchard, manufacturers of machine tools for the automotive, aircraft and energy industries, as well as for general metal working.

As director of a highly technical operation, Mr. Youden is particularly interested in obtaining trained technical people. He has served on the VTC Mechanical Engineering Curriculum Advisory Committee and has actively promoted in-house technical training for employees.

The Technical Advisory Council was chaired by:

MR. TIMOTHY L. DONOVAN TEL. 828-2401
VERMONT STATE COLLEGES
OFFICE OF EXTERNAL PROGRAMS
P. O. BOX 292
MONTPELIER, VT 05602

DIRECTOR

The Office of External Programs is charged with coordinating off-campus and adult-oriented programs, for the five Vermont State Colleges. As Director of the Office of External Programs, Mr. Donovan is primarily involved in matching business, industry, and adult learner needs with the resources of the public higher education system.

Over the past six years, Mr. Donovan has worked closely with Vermont's higher education resources, state agencies and business/industrial groups. His interest is in creating an educational and training environment which will promote the growth of the types of industry which preserve Vermont's natural resources.

Staff assistance was provided by:

W. NORMAN VERCOE TEL. 828-2401
VERMONT STATE COLLEGES
OFFICE OF EXTERNAL PROGRAMS
P. O. BOX 292
MONTPELIER, VT 05602

COORDINATOR OF TRAINING SERVICES

Norm is responsible for executing the terms of the High

Technology Consortium contract held by the Vermont State Colleges. He functions under the direction of the Office of External Programs and with the guidance of the Technical Advisory Council.

A native of Vermont, Norm combines the viewpoints of industry and education through twenty years of experience with General Electric and ten years with the University of Massachusetts. His work at the University of Massachusetts was largely building programs for business and industry including the transfer of high technology. He sees the economic success of Vermont tied to its ability to implement education and training for the emerging technologies of our time.

*Note: The shared appointments of Mr. Dworshak and Mr. Eaton resulted from Mr. Eaton's appointment as Secretary of the Agency of Development and Community Affairs

APPENDIX II

HIGH TECHNOLOGY CONSORTIUM
VERMONT STATE COLLEGES

SKILLS LIST BY JOB TITLE

1. Electronic Engineer

   Can design and develop test programs and procedures
   Can resolve technical problems related to designing, manufacturing and testing semiconductor and hybrid circuits
   Knowledge of digital and analog circuit design (3)
   Drafting skills
   Design of interfaces between computers and peripheral equipment (2)
   Design high speed disk controllers (2)
   Design computer memory subsystem
   Can engineer electrical controls and equipment for complete machines
   Can work on servos
   Can understand logic network
   Knowledge of failure analysis
   Knowledge of magnetics

2. Mechanical Engineer

   Optical expertise
   Fluid mechanics expertise
   Indepth knowledge of robotics
   Conversant with the metric system
   Drafting skills
   Can design various component and subassembly units on machines
   Keeps records relative to the most cost effective methods of manufacturing
   Can design high speed servos
   Can do stress and vibration analysis
   Knowledge of magnetics
   Supervisory skills

3. Industrial Engineer

   Set up electronic test devices for manufactured component
   Can design test circuitry for manufactured components
   Exposure to computers and data processing
   Familiar with the metric system
   Familiar with CAD and computer reporting techniques
   Responsible for the direction of N.C. programmers (2)
   Knowledge of value analysis cost reduction (2)
   Knowledge of manufacturing techniques of small precision assemblies (2)
   Personnel management skills (2)

4. Systems Engineer

   Can design operating systems
   Has expertise in graphics
   Has expertise in signal processing

5. Computer Applications Engineer

Has expertise in graphics, signal processing, and musical compositional aids software
Has knowledge of operating system design
Can formulate and solve complex math problems in conjunction with the development of machine control systems
Has a thorough knowledge of analogs and digital circuitry
Can coordinate the overall computer controlled system on machine with rest of machine
Can use a variety of equipment including plotters, voltmeters, oscilloscopes, etc.

6. Customer Engineer

Strong technical background
Some familiarity with data processing equipment (2)
Strong background in manufacturing processes
Foreign language skills
Can convey complete product info, including cost, machine capabilities and delivery times, to customers
Works closely with Electrical and Mechanical Engineers
Can get along with people
Willing to travel 60% of the time
Can troubleshoot both analog and digital electronic equipment

7. Environmental Engineer

8. Chemical Engineer

9. Mathematician

10. Computer Systems Analyst

Ability to relate to user needs
Experience in all areas of manufacturing, accounting, and sales
Managerial and supervisory skills (2)
Assures sound planning, development, and promotion of an integrated management operating system
Can effectively and economically utilize data processing equipment and assure accurate collection and processing of data

11. Electronic Technicians

Debug circuits
Knowledge of automated testers (5)
Read and understand schematics
Updated knowledge of mechanical/electrical interfaces
Capable of minor design of test equipment

12. Electronic Component Processor

Able to work with handtools
Understands soldering
Repetitive work
Can follow instructions

13. Engineering Technician

Able to read and build from schematics
Understanding of electronic theory
Operate a variety of test equipment
Maintain and calibrate test equipment
Promotes customer relations

14. Office Technician

15. Drafter

True position tolerancing
Can detail drawings from rough sketches
Can implement improvements to existing design
Has a good understanding of various machines and their structure

16. Numerical Control Programmer

Strong background in metal cutting, tool applications, and calibrations of machine feeds and speeds (2)
Able to analyze blue prints

17. Computer Programmer, Business

18. Computer Programmer, Scientific and Technical

Can diagnose routines for different computer systems
Knowledge of several languages
Understands computer architecture
Can relate to user needs
Supervisory skills

19. Technical Illustrator

Working knowledge of isometric, dimetric and perspective

20. Tool and Die Maker

Must be conversant with metric and European drawing standards

21. Electronic Assembler

Skills for assembly, soldering, testing and quality inspection
Use of computer to program machine to assemble printed circuit board

22. Machine Assembler

Emphasis on machine rebuilding and modification
Ability to read assembly blue prints
Capable of winding machine set up
Ability to wind, assemble, solder, test and inspect final product
Conversant with the metric system

23. Machine Tool Operator

Manufacturing experience
Practical shop mathematics
Numerical control skills

24. Telephone Operator

25. Clerical Occupations

Can type and file (2)
Knowledge of shorthand
Knowledge of accounts receivable, inventory, fixed assets and general ledger
Knowledge of computer processing (4)
Knowledge of shipping documents
Mini computer operation and data entry languages
Supervisory skills

APPENDIX III

OCCUPATIONS IMPORTANT TO HIGH TECHNOLOGY INDUSTRIES

1. Electrical/Electronic Engineer

Electrical Engineer: Performs a variety of engineering work in designing, planning, and overseeing manufacture, construction, installation, operation, and maintenance of electric or electronic components, equipment, systems facilities, and machinery used in generation, transmission, distribution, and utilization of electrical energy for domestic, commercial, or industrial consumption.

Electronic Engineer: Conducts research and development concerned with design and manufacture of vacuum and gaseous tubes, semiconductor and other solid-state devices, and electronic equipment and their application to commercial, industrial, military, scientific, and medical equipment, processes, and problems.

Skills

Can design and develop test programs and procedures
Can resolve technical problems related to designing, manufacturing and testing semiconductor and hybrid circuits
Knowledge of digital and analog circuit design (5)
Drafting skills
Design of interfaces between computers and periperal equipment (3)
Design high speed disk controllers (2)
Design computer memory subsystem
Can engineer electrical controls and equipment for complete machines
Can work on servos (2)
Can understand logic network
Knowledge of failure analysis
Knowledge of magnetics
Can utilize computers for modeling and simulation of electronic circuits
Working knowledge of TTL logic and microcomputer circuitry
Able to make up prototypes from circuit schematic diagrams
Mechanical ability to make up prototype models
Able to understand and work with electronic test equipment, oscilloscopes, meters
Can program microprocessors or microcomputers using assembly language

2. Mechanical Engineer

Performs a variety of engineering work in planning and design of tools, engines, machines, and other mechanically functioning equipment; and oversees installation, operation, maintenance, and repair of such equipment, including centralized heat, gas, water, and steam systems.

Skills

Optical expertise
Fluid mechanics expertise
Indepth knowledge of robotics
Conversant with the metric system
Drafting skills
Can design various component and subassembly units on machines (2)
Keeps records relative to the most cost effective methods of manufacturing
Can design high speed servos
Can do stress and vibration analysis
Knowledge of magnetics
Supervisory skills
Can perform professional engineering analysis, create advanced conceptual designs, and direct the development, fabrication and test of new or improved high-speed electro-mechanical systems
Familiarity with military specifications for hardware design, experience with armament systems
Ability to use state-of-the-art computer-aided engineering design and analysis tools
Can design tools to machine parts per customer print
Knowledge of CAD-CAM systems
Knowledge of metallurgy and space age materials
Knowledge of casting, forming, injection molding and machining

3. Industrial Engineer

Performs a variety of engineering work in planning and overseeing utilization of production facilities and personnel in department or other subdivision of industrial establishment. Plans equipment layout, workflow, and accident prevention measures to maintain efficient and safe utilization of plant facilities. Plans and oversees work study and training programs to promote efficient manpower utilization. Develops and oversees quality control, inventory control, and production record systems.

Skills

Set up electronic test devices for manufactured component
Can design test circuitry for manufactured components
Exposure to computers and data processing
Familiar with the metric system
Familiar with CAD and computer reporting techniques
Responsible for the direction of N.C. programmers (2)
Knowledge of value analysis cost reduction (2)
Knowledge of manufacturing techniques of small precision assemblies (2)
Personnel management skills (2)

4. Systems Engineer

Analyzes data-processing requirements to determine electronic data processing system that will provide system capabilities required for projects or workloads and plans layout of new system installation or modification of existing system, utilizing knowledge of electronics and data-processing principles and equipment. Confers with data-processing and project managerial personnel to obtain data on limitations and capabilities of existing system and capabilities required for data-processing projects and workload proposed. Analyzes data to determine, recommend, and plan layout for type of computer and peripheral equipment, or modifications to existing equipment and system, that will provide capability for proposed project or workload, efficient operation, and effective use of alloted space.

Skills

Can design operating systems
Has expertise in graphics
Has expertise in signal processing

5. Computer Applications Engineer

Formulates mathematical models of systems, and sets up and controls analog or hybrid computer system to solve scientific and engineering problems. Consults with originator of problem to determine sources and methods of data collection and methods of determining values of variables, or examines and studies physical models, graphic representations, and verbal descriptions of problem to apply knowledge of scientific discipline and define problem. Prepares mathematical model of problem, and draws data-flow chart to indicate mathematical steps required to solving problem. Computes voltage and time scales to convert mathematical equation into computer equation to obtain potentiometer settings. Draws computer-circuit diagrams to indicate connections between components and their values, and wires patchboard onto computer. Observes behavior of variables on output devices such as plotters, recorders, digital voltmeters, oscilloscopes, digital displays and originator, describing step-by-step solution of problem. Develops new techniques for solving problems, and prepares articles for publication in scientific journals.

Skills

Has expertise in graphics, signal processing, and musical compositional aids software
Has knowledge of operating system design
Can formulate and solve complex math problems in conjunction with the development of machine control systems
Has a thorough knowledge of analogs and digital circuitry (2)
Can coordinate the overall computer controlled system on machine with rest of machine
Can use a variety of equipment including plotters, voltmeters, oscilloscopes, etc.
Can develop product software including assembly level programming
Experience or formal training in modern or classical control theory
Hardware or systems design experience with digital computer systems

6. Customer Engineer

Engaged in selling and/or servicing customer equipment. Requires knowledge equivalent to at least that of a four-year college course with a major in one of the Engineering disciplines appropriate to the equipment involved.

Skills

Strong technical background
Some familiarity with data processing equipment (2)
Strong background in manufacturing processes
Foreign language skills
Can convey complete product information, including cost, machine capabilities and delivery times, to customers
Works closely with Electrical and Mechanical Engineers
Can get along with people
Willing to travel 60% of the time
Can troubleshoot both analog and digital electronic equipment
Can conceptualize tools needed to produce customers parts
Knowledge of marketing skills to aid the sales agents

7. Environmental Engineer

Engineering personnel who utilize engineering knowledge and technology to identify, solve, or alleviate environmental problems. Apply knowledge of chemical, civil, mechanical, or other engineering discipline to preserve the quality of life by correcting and improving various areas of environmental concerns, such as air, soil, or water pollution.

Skills

8. Chemical Engineer

Designs chemical plant equipment and devises processes for manufacturing chemicals and products such as gasoline, synthetic rubber, plastics, detergents, cement, and paper and pulp, applying principles and technology of chemistry, physics, and engineering.

Skills

9. Mathematician

Conducts research in fundamental mathematics and in the application of mathematical techniques to science, management and other fields, and solves or directs solutions to problems in various fields by mathematical methods.

Skills

10. Computer Systems Analyst

Analyzes business, scientific, and technical problems for application to electronic data processing systems. Exclude persons working as Engineers, Mathematicians, or Scientists.

Skills

Ability to relate to user needs
Experience in all areas of manufacturing, accounting, and sales
Managerial and supervisory skills (2)
Assures sound planning, development, and promotion of an integrated management operating system
Can effectively and economically utilize data processing equipment and assure accurate collection and processing of data

11. Electrical and Electronic Technicians:

Count in this group technicians with a background in electrical or electronic theory, physical science, and mathematics which enables them to perform jobs above the routine operating or maintenance levels. Normally, such employees are engaged in constructing, repairing, testing, installing, modifying, operating or even designing a variety of production or experimental types of complex electrical or electronic equipment.

Skills

Debug circuits (2)
Knowledge of automated testers (5)
Read and understand schematics
Updated knowledge of mechanical/electrical interfaces (2)
Capable of minor design of test equipment (2)
Two years Technical School graduate or Technical Mfg. Apprentice graduate or equivalent military schooling
Two years of work experience in the construction, fabrication and troubleshooting of electronic equipment
Completion of approved soldering course
Experience of a wide variety for construction, maintenance and calibration of electronic instruments, familiar with digital logic circuits and microcomputer use or application
Demonstrated leadership and self starting capabilities
Able to develop microcomputer programs
Can analyze problems with high power R.F. transmitters
Can analyze propagation and path losses in R.F. transmission
Can "hear" audio distortion and extraneous audio products
Knowledge of music performance helpful
Can take a customer's requirement for transmission and dissemination of digital and/or analog information and convert it into a form useable over subcarriers of WVPR and WVPS, fit it into a master schedule of transmission lines
Supervisory capability
Can repair electronic pulse motors and relays
Knowledge of computer numerical controlled machines

12. Electronic Component Processor

Performs any combination of the following duties to process materials and components used in manufacture of electronic equipment: Reads sequence and processing charts work orders and formulas and receives verbal instructions regarding duties to be performed. Measures and mixes specified amounts of material, using spatulas, mixing machines, scales, and graduates. Loads material onto holding device or vessel and places in processing machine or equipment. Actuates starting mechanism and monitors controls of machine or equipment which processes material by baking, casting, fusing, diffusing, polishing, coating, plating, granulating, blending, grinding, or using similar procedures to change material form, sturcture, or electrical properties. Cleans material prior to individual processing procedures using tweezers or specially devised holding instruments and various cleaning agents. Maintains production records. May position parts and materials such as crystal chips, solder, metal disks and lead wires prior to firing. May tend related equipment which performs operations such as welding, crimping, and compression bonding to enclose components in housings. May examine crystal structure or locate axis, using X-ray equipment. May stamp or etch identifying information or other data on finished component, using press, stamping machine, or etching equipment. May set or make adjustments to machine controls, change guides or templates, and perform minor maintenance and cleaning to maintain efficient operation and production standards. May test component, using electronic test equipment to insure specifications are being met. May examine component, using microscope or magnifying device to detect manufacturing defects and blemishes. May measure component, using fixed and moving measuring instruments and electronic gages to insure dimensional specifications are being met. May sort components according to electrical characteristics, using specialty measuring and sorting instruments. May count processed items or determine count, using scale and weight count chart for specific item.

Skills

Able to work with handtools
Understands soldering
Repetitive work
Can follow instructions

13. Engineering Technician

Include technicians concerned with the practical application of physical laws and principles of engineering for the development and utilization of machines, materials, instruments, structures, processes, and services. May have familiarity with computer controlled manufacturing processes.

Skills

Able to read and build from schematics
Understanding of electronic theory
Operate a variety of test equipment
Maintain and calibrate test equipment
Promotes customer relations
Can read and interpret engineering drawings
Can express himself through written documentation (reports, test plans, memos, etc.)
Can perform at high skill level in one or more of following: drafting, mechanical inspection, machining, mechanical assembly (2)
Can produce prototype machinery from rough sketches, engineering concepts, etc.
Experience at off-site customer support or test location
Two years technical school, apprentice program graduate, or equivalent
Must be familiar with computer controlled manufacturing processes
Knowledge of state-of-the-art manufacturing processes
Can perform time studies
Can use value analysis

14. Office Technician

Include all persons whose principal duty is operating an office machine, e.g. Bookkeeping-Machine Operator; Duplicating Machine Operator; Tabulating Machine Operator; Console (Computer) Operator; and Keypunch Operator; Word-Processing Equipment Operator.

Skills

Principal duty is operating an office machine; e.g. Bookkeeping-Machine Operator; Duplicating Machine Operator; Tabulating Machine Operator; Console (Computer) Operator; and Keypunch Operator; Word-Processing Equipment Operator.

15. Drafter

Prepares clear, complete, and accurate working plans and detail drawings from rough or detailed sketches or notes for engineering or manufacturing purposes, according to specified dimensions. Utilizes knowledge of various machines, engineering practices, mathematics, building materials, and other physical sciences to complete drawings. May use computer-aided design equipment.

Skills

True position tolerancing
Can detail drawings from rough sketches
Can implement improvements to existing designs
Has a good understanding of various machines and their structure
Two years Technical School graduate Apprentice Graduate or equivalent experience
Experience in drafting or related areas

16. Numerical Control Programmer

Plans and prepares programs to control machining of metal parts by automatic machine tools utilizing magnetic tape, punched tape, and punched cards. Work involves most of the following: Analyzing blueprints and engineering drawings to determine dimension of parts and configuration of cuts; drawing sketches of part of plan number, location, and direction of cutter paths; determining type and size of cutting tools, according to hardness of metal stock and shape of cut; determining position of metal stock on machine fixture and point on stock at which machining should start, sequencing all necessary steps (such as cutter change points, cutter speeds, etc.), and preparing program to produce the desired part or product; observing machining of first part produced by automatically controlled machine to verify accuracy of programming. May determine suitability of part for machining by automatic machines.

Skills

Strong background in metal cutting, tool applications, and calibrations of machine feeds and speeds (2)
Able to analyze blue prints
Machine shop apprenticeship program or equivalent breadth of machining knowledge
Experience as a tool and die maker
Conventional machining planning experience
Must be familiar with CAD-CAM

17. Computer Programmer, Business

Converts symbolic statement of scientific, engineering, and other technical problems to detailed logical flowcharts for coding into computer language and solution by means of automatic data processing equipment. May convert detailed logical flowchart to language processable by computer.

Skills

Can analyze application problems of a moderately complex nature and variety, determine the computer approaches required to resolve these problems, and develop, code, and test the required programs

COBOL programming experience on Honeywell or Digital Equipment Corporation hardware

Basic knowledge of manufacturing processes and procedures

18. Computer Programmer, Scientific and Technical

Converts symbolic statement of business problems to detailed logical flowcharts for coding into computer language and solution by means of automatic data processing equipment. May convert detailed logical flowchart to language processable by computer .

Skills

Can diagnose routines for different computer systems
Knowledge of several languages
Understands computer architecture
Can relate to user needs
Supervisory skills

19. Technical Illustrator

Draws or paints illustrations for use by various media to explain or adorn printed or spoken word. Studies layouts, sketches of proposed illustrations, and related materials to become familiar with assignment. Determines style, technique, and medium best suited to produce desired effects and conform with reproduction requirements or receives specific instructions regarding these variables. Formulates concept and renders illustration and detail from models, sketches, memory, and imagination. Discusses illustration at various stages of completion and makes changes as necessary. May select type, draw lettering, lay out material, or perform related duties. May be identified according to specific style, technique, medium, subject material or combination of variables.

Skills

Working knowledge of isometric, dimetric and perspective

20. Tool and Die Maker

Analyzes variety of specifications, lays out metal stock, sets up and operates machine tools, and fits and assembles parts to make and repair dies, cutting tools, jigs, fixtures, gauges, and machinists' hand tools.

Skills

Must be conversant with metric and European drawing standards
Three-five years machining experience or Technical Manufacturing Apprentice Graduate
Ability to read and interpret simple mechanical drawings and sketches
Shop math
Machine background - engine lathe, mills, drills, grinders, jig bore

21. Electronic Assembler

Assembles or modifies prototypes or final assemblies of electrical or electronic equipment, such as missile control systems, radio and test equipment, computers, machine-tool numerical controls, radar and sonar, telemetering systems, appliances, etc. This occupation requires specific vocational or on-the-job training of more than 30 days.

Skills

Skills for assembly, soldering, testing and quality inspection
Use of computer to program machine to assemble printed circuit board
Ability to read and apply information from manufacturing plannings, wiring lists, and drawings
Successfully complete 40 hour soldering school as provided

22. Machine Assembler

Constructs, assembles, or rebuilds machines or equipment, such as engines, turbines, construction, oil field, rolling mill, textile, woodworking, paper, printing, or food wrapping machinery, or office machines. Fits or assembles components or subassemblies. Installs moving parts, and assembles system of gears by aligning and meshing gears in gearbox. May test or assist in testing operation of completed product. Include workers who primarily assembly electrical systems for machinery. This occupation requires specific vocational or on-the-job training of more than 30 days.

Skills

Emphasis on machine rebuilding and modification
Ability to read assembly blue prints
Capable of winding machine set up
Ability to wind, assemble, solder, test and inspect final product
Conversant with the metric system

23. Machine Tool Operator

Include all machine tool operators who are required alternately to operate more than one type of nonportable power-driven machine tool that shapes metal by progressively removing portions of the stock in the form of chips or shavings or by abrasion such as lathes, boring machines. May set up as well as operate machine.

Skills

Manufacturing experience
Practical shop mathematics (3)
Numerical control skills
Thorough understanding of shop math, blueprint reading, use of precision measuring instruments (2)
Can operate various fabricating machines
Can calculate for bend allowances and deductions
Can fusion weld and determine shrinkage direction

24. Telephone Operator

Operates cord or cordless switchboard to relay incoming, outoing, and interoffice calls. On cordless switchboard, pushes switch keys to make connections and relay calls. On cord type equipment, plugs cord into switchboard jacks. May supply information to callers and record messages. May keep record of calls placed and toll charges. May perform clerical duties, such as typing, proofreading, and sorting mail. May operate system of bells or buzzers to call individuals in establishment to phone. May receive visitors, obtain name and nature of business, and schedule appointments.

Skills

25. Clerical Occupations

Include office and plant clerical personnel. Office clerical work involves preparing, transcribing, transferring, systematizing, and preserving communications and records; collating accounts and distributing information. Typical examples are: Secretaries; Stenographers; Typists; File Clerks; Office Machine Operators; Bookkeepers; Cashiers; Messengers; Telephone Operators; etc. Plant clerical work involves planning, coordinating, or expediting production and the flow of work; or the clerical aspects of receiving, storing, issuing, or shipping of materials, merchandise, supplies, or equipment.

Skills

Can type and file (3)
Knowledge of shorthand (2)
Familiar with computers and computer application (5)
Knowledge of accounts receivable, inventory, fixed assets and general ledger
Knowledge of shipping documents
Mini computer operation and data entry languages
Supervisory skills
High school graduate, one year or more clerical experience, secretarial school
Word processing skills
Preparing, transcribing, transferring, systematizing, and preserving communications and records; collating accounts and distributing information.
Planning, coordinating, or expediting production and the flow of work; or the clerical aspects of receiving, storing, issuing, or shipping of materials, merchandise, supplies or equipment

APPENDIX IV

Federal Identifying Number	Job Title	Estimate of Openings 1983 to 1990
21005	Electrical/Electronic Engineers	770
21008	Mechanical Engineers	217
21006	Industrial Engineers	378
24002 003.167-062	Systems (Engineer) Analyst S & T	*
020.062-010	Computer Applications Engineer	*
71998	Customer Engineer (Sales Reps. Technical)	1211
21012	Environmental Engineer (Safety Engineer)	*
21003	Chemical Engineer	7**
22103	Mathematician	7**
24000	Computer Systems Analyst	112
32004	Electrical/Electronic Technician	182
590.684-014	Electronic Component Processor	*
32000	Engineering Technician	756**
61100	Office (Technician) Machine Operator	581
32003	Drafter	182
32011	Tool Programmer, Numerical Control	10
31001	Computer Programmer, Business	364
31002	Computer Programmer, Scient. & Tech.	
017.281-034	Technical Illustrator	*
55D23	Tool & Die Maker	77
55U84	Electrical/Electronic Assembler	448
55U81	Machine Assembler	154
55L01	Machine Tool Operator	238**
235.662-022	Telephone Operator	231
60000	Clerical Occupations	4165**
019.061-018	Optical Engineer	*
716.382-014	Optical Element Coater	**
716.280-010	Optician Apprentice	84**
55D69 716.280-008	Optician	**
023.061-014	Physicist	4**

*Data not available in this category nor in categories comparable to that under consideration.

**Estimates achieved by combining data or by interpretation of data from related tables.

NOTES

* These notes explain the absence of figures in the estimated openings column.

** These notes explain the basis for estimated figures given in the estimated openings column.

*24002	Systems Engineer not listed. Systems analyst, EDP data presented under 2400 Computer Systems Analyst.
*020.062-010	Computer Applications Engineer not listed. No related data found.
*21012	Environmental Engineer not listed. No related data found.
**21003	Chemical Engineer not listed in Table 4. Estimate made from data in Table 3.
**22103	Mathematician not listed. Estimate made from data in Table 3.
*590.684-014	Electronic Component Processor not listed. No related data found.
**32000	Engineering Technician too inclusive. Added Mechanical Engineering Technology and Engineering and Science Technology.
*017.281-034	Technical Illustrator not listed. No related data found.
**55101	Machine Tool Operator data is a combination of data listed under Machine Tool Operator and Numerical Control.
**6000	Clerical occupations achieved by deducting Other Clerical Workers from Clerical Workers.
*019.061-018	Optical Engineer not listed. No related data found.
**716.382-014 716.280-010 55D69 716.280-008	These occupations not listed. Related data found under Opticians, Lens Grinders, Polishers in Table 3. This data presented to cover the combination of titles.
**023.061-014	Physicist not listed. Estimate made from data under Physicist-Table 3.

APPENDIX V

SUGGESTED TRAINING COURSES FOR INDUSTRY
(no particular order)

1. Digital and Analog Circuit Design
2. Test Programs and Procedures including automated testing
3. Drafting (including CAD)
4. Computer Design - central and peripheral
5. Computer Programming
6. Development and Construction of Prototypes
7. Servomechanisms and Feedback Systems
8. Value Analysis
9. Personnel Management
10. Metric System
11. Machine Design
12. Fluid Mechanics
13. Optics
14. Stress and Vibration Analysis
15. Understanding Military Specifications
16. Machining
17. Materials Science/Metallurgy
18. Casting, Forming, Injection Molding
19. Manufacturing Techniques and Processes
20. Computer familiarity
21. Foreign Languages
22. Salesmanship
23. Electromechanical Interfaces
24. Soldering
25. Microcomputers
26. R. F. Transmission
27. The Physics of Music
28. Pulse Motors and Relays
29. Principles of Computer Numerical Controls
30. Hand Tools
31. Customer Relations
32. Blueprint Reading
33. Effective Speaking and Writing
34. Conceptual Engineering
35. Automated Office Operation and Management
36. Computer Graphics
37. Systems Analysis
38. Mathematics for Machine Control Systems
39. Classical Control Theory
40. Accounting
41. Computer Languages
42. Welding
43. Metal Fabrication Techniques
44. Office Skills (typing, shorthand, filing, phone, etc.)
45. Records Management

APPENDIX VI

Content Areas Designated
for receipt of RFP's

F=Facilities Resource
I=Instructional Resource
B=Both

	Agriculture	Arts	Business Skills	Communications	Computers	Education	Energy	Finance	Food Service	Government	Health Care	Human Development	Industrial Skills	Legal Training	Management	Math and Science	Office Skills	Personnel	Recreation	Supervision	Technology	Women's Studies	Internatl. Mgmt.	Negotiation
ADDISON CTY VOC CTR	B		B		B				B		B	B	B				B				B			
BARRE VOC CTR	B		B		B	B		B	B				B				B	B		B				
BRADFORD VOC CTR																								
BRATTLEBORO VOC CTR	F		F		F				F		F	F	F				F				F			
BURLINGTON VOC CTR					B						B	B	B				B				B			
ENOSBURG FALLS VOC CTR	B		B		B								B		B		B	B	B	B				
ESSEX JCT VOC CTR																								
HARTFORD VOC CTR																								
LAMOILLE VOC CTR	B		B		B				F				B				B							
Mt ANTHONY VOC CTR	B		B		B				B			B					B							
NORTH COUNTRY VOC CTR																								
RANDOLPH VOC CTR																								
RUTLAND VOC CTR																								
St ALBANS VOC CTR	F		B		B				F		I		F			B	B			F	B	F		
St JOHNSBURY VOC CTR		B	B		B	B			B		B		B		B	B	B				B			
SPRINGFIELD VOC CTR																								
BENNINGTON COLLEGE	F	B	F	B	B	B	B	F	F	B	B	F	F	F	F	B	F	F	B	F	B	B		
BURLINGTON COLLEGE		I	I	I		I	I				B	B									I	I		
CASTLETON ST COLLEGE	F	B	B	B	B	B	B	B	B	B	B	B	F	F	B	B	B	B	B	B	F	B		
CHAMPLAIN COLLEGE			B		B			B				B			B		B			B	B			
COLL ST JOSEPH THE PROV																								
COMM COLLEGE OF VT	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		B	B	B		
COUNTRY SCHL OF PHOTOG																								
ETHAN ALLEN COMM COLL		B	B		B			B	B			B			B		B	B						
F ALLEN SCHL PRACT NURS											F													
GODDARD COLLEGE	I	B	B	B	B	B	I	B	B	I		B			B							B		
GREEN MOUNTAIN COLLEGE																								
JOHNSON ST COLLEGE		B			B	B	I	I		B		I			B	B		I	I			I		
LYNDON ST COLLEGE																								
MARLBORO COLLEGE																								
MIDDLEBURY COLLEGE																								
N.E. CULINARY INST.									B															
NORWICH UNIVERSITY		B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
PROSPECT ARCHIVE		B				B						B								B				
PUTNAM SCHL PRACT NURS											B													
RUTLAND SCHL RADIOL TECH																								
ST MICHAEL'S COLLEGE																								
SCHL FOR INTNATL TRNG				B		B	B	B				B			B			B				B	B	B
SOUTHERN VERMONT COLLEGE																								
STERLING COLLEGE																								
THOMPSON SCHL PRACT NURS											B													
TRINITY COLLEGE		B	B	I	B	B		B							B	B	B	B				B		
UNIVERSITY OF VERMONT																								
VERMONT COLLEGE																								
VERMONT LAW SCHOOL																								
VERMONT TECHNICAL COLLEG	B		B	B	B		B						B			B	B				B	?		
WOODBURY ASSOCIATES				B						B		B		B										
EDGAR W DAWES CONSULTANT			I												I						I			
INTER-DISC EDUC ASSOC					I	I							I			I	I				I			
VT PARAMEDIC TRNG PROG											B													

I-1